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HELMINTHIASIS.

FAR EASTERN ASSOCIATION OF TROPICAL MEDICINE, TRANSACTIONS OF THE SEVENTH CONGRESS, BRITISH INDIA, 1927. Vol. 3. pp. 196–309. **[16 papers on Helminthiasis.]**

LABERNADIE reports faecal examinations, presumably by smear, made at Pondichery on 565 persons with these percentages of infection—Ascaris 28, ankylostomes 21, trichuris 26, strongyloides 1·5. SIOE has had success with oral adult doses of 0·6 gm. of gentian violet in two strongyloides infections, and relates a third and fatal case, in which other drugs only were given. NAGANO suggests dealing with the prophylaxis of clonorchis by attack upon bythinia on two lines. The first is the systematic removal of water plants on which the spawn is laid, thus enabling fish to reach and devour the young snail spawn; while at the same time brushwood is placed in the water channels, and periodically lifted out and the overlying spawn destroyed. The second is to take advantage of the illness induced in the snails by parasitism. He has found that nine cercariae other than those of *C. sinensis* infest bythinia, and that the effect of parasitism is loss of reproduction—"parasitic castration" he terms it; and he advised that such hyper-infestation should be used to destroy the snails.

KENDRICK reports on two groups, the first 13,303 men, women and children emigrating from India to Ceylon, the second 275 prisoners. The latter were dealt with intensively, egg counts being made by the Stoll-Tseng technique and reduced to formula of formed stools, and the men treated till D.C.F. detected no eggs a fortnight after the last treatment. In the latter group ancylostomes were to necators as 5·5 to 94·5. Eighteen deliberate infections were made and weight and haemoglobin recorded. Loss of weight after infection is noted in 15 varying from 2 to 15 lbs. In those of them already treated at the time of report the smallest number of worms recovered was 72 with a loss of weight of 4 lbs., and in the untreated the lowest egg counts were 2,200 per gram and the loss in weight 2 and 5 lbs. respectively. The

(15390) Wt P5/68 1,875 3/31 H & Sp Gp 52

percentage losses of haemoglobin in these three men were respectively 10, 10 and 15. For the rest the argument takes mathematical lines, thus, " The regression equation giving the average eggs per gram (x) for persons whose degree of hookworm infestation is known is, in the usual notation :—

$$(x\text{—mean}) = r\frac{\delta x}{\delta y}(y\text{—mean}).$$"

And again speaking of the lack of variation in the coefficient of correlation, " This means that when worm-counts are known it is possible, on the average, to estimate the egg-counts and vice versa." [In view of the findings of SARLES (this *Bulletin*, Vol. 27, p. 423) and of HILL (this *Bulletin*, Vol. 24, p. 196) that the egg output varies with the number of worms harboured, the abstractor analysed KENDRICK's figures, given in his Table XIII. In four persons in whom the worms recovered were between 1 and 55 the average egg output per day per female worm was 28,080 ; in three in whom it lay between that and 155 it was 20,699 per day, and in two in whom it was over 155 the average egg output per female per day was 11,792. In spite then of the striking mathematical formula and the coefficient of correlation there was in fact no parallelism between the average worm count and the average egg count. Relatively the egg count fell as the worm count rose.]

SWEET concludes that the average Ceylonese has an intensity rate of hookworm infection of 2,200 eggs per gram " basis formed faeces," approximately 100 hookworms, that average egg counts in children of 7 to 14 are equal to those of adults, so that it is possible to estimate adult averages by examining school children, and that " but 53 per cent. of the people had what SMILLIE classified as hookworm disease, the remainder being merely carriers of worms." He used Stoll's method and, if it showed no ova, Willis's. Apparently a positive Willis was in these circumstances counted statistically as negative. There were examined 32,507 persons and it is added, with regard to mere positive or negative results by such examinations : " On the basis of these results, the only information obtainable in bulk before the publication of egg-counting methods, the hookworm problem of Ceylon would have been regarded as uniform throughout the island." [It is then interesting to see how the nine provinces arranged themselves : (1) by percentage of positives to these techniques ; (2) by number of eggs counted.

(i) Uva ; Western ; Central ; Sabaragamuwa ; Southern ; Eastern ; Northern ; North Western ; North Central.

(ii) Uva ; Western ; Central ; Southern ; Eastern ; Sabaragamuwa ; Northern ; North Western ; North Central.

Their order is the same, except that No. 4 in (i) is No. 6 in (ii). Which is correct?]

KORKE, using Stoll's method of counting eggs as a test of the presence or absence of infection, concludes that there is correlation between hookworm prevalence and agricultural and economic conditions, that moisture is important, that a mean of 20 worms represents 1 unit of moisture or soil fertility of the first degree by Brierson-Moore's classification, that those resident on a slope have half the infection of those living on a level surface ; so people should be encouraged to defaecate on a dry slope.

THAPAR's report that all dogs he examined were infected with *A. duodenale* is reasonably explained as an error in identification.

FAUST & KELLOGG examined about 500 stools by three smears stained with eosin-iodine. They note :—

" (1) The small number of species and low incidence of intestinal protozoa.

" (2) The uniformly heavy infection with *Ascaris* and to a somewhat lesser degree of *Trichuris*.

" (3) The low (sub-clinical) incidence of hookworm infection in the area, except in the Hak Ka villages near Foochow, where a heavy infection of apparently pure *Ancylostoma duodenale* was encountered.

" (4) The absence of Taenia, Echinococcus, Hymenolepis and Dipylidium infection in the human population ; the occasional presence of *Sparganum mansoni* in man and the possibility of human infection with the adult *Diphyllobothrium*, due to the high infectivity of the intermediate hosts commonly consumed as food without sufficient heating.

" (5) The incidental infection with *Schistosoma japonicum* and *Fasciolopsis buski* in the vicinity of Foochow.

" (6) The complete absence of Clonorchis infection in man and in dogs and its low percentage of infectivity in cats."

From persons spread through the Malay Archipelago BRUG encountered in blood smears a microfilaria which he separated specifically from *Mf. bancrofti* and here designated *Mf. malayai*. In the latter the nerve ring is rather further back, the excretory pore differs little in position, the anal pore and the caudal end of the continuous nuclear column are further forward than in *Mf. bancrofti*. As regards structural differences, the cephalic space is twice as long in *Mf. malayi*, the nuclei form a confused mass. The genital cells G 2, G 3, and G 4 are separated from each other and from the genital pore under vital staining. With haematoxylin the anal pore is a very clear oval gap in the nuclear column for half or the whole of its depth. The tail is a fine thread sometimes swollen at its tip, usually with 2 nuclei, the anterior rounded, the posterior oval or like a point of exclamation. The total length is 187 to 265 μ. The curves are not as a rule long and graceful, and transverse cuticular striation is little marked.

RAO reports on filariasis survey work over a large part of the north and east of India. Among much of local importance the following may be noted. In Cuttack jail the microfilaria rate is 25 per cent., in the town 12 ; in Calcutta judged by hospital examinations 10. In these places, wild *Culex fatigans* were on the average infected to the extent respectively of 10 and 2·5 per cent. But infection varied with season, the figures being for July 3, August to October 7·5, November–December 12·5. The same held for experimental feeding, the percentage of these mosquitoes which could be infected from infective feeds was in May and June 13, August to October 34, December and January 78. Drug treatment has proved of little value, but intradermal injections of mixed streptococcus-staphylococcus vaccine had checked lymphangitic attacks and reduced oedema.

Clayton Lane.

SHARMA (A. N.). **Helminthic Infections in Shillong.**—*Indian Med. Gaz.* 1930. Apr. Vol. 65. No. 4. pp. 200–203. With 2 text figs.

Stools were examined (1) diluted with normal saline, (2) stained by Gram's iodine method, (3) by D.C.F. Apparently the totals given resulted from a combination of all three. The numbers were 540 and

685 stools from two Gurkha battalions and 503 from civilians. The percentages of infection discovered were :—

	All examined.	Civilians.	Battalion 1.	Battalion 2.
Total infected ...	60·5	64·8	75·7	45·4
Ascaris	57·5	60·4	73·3	43·0
Hookworms	22·9	31·01	26·6	14·0
Trichuris	13·4	17·5	15·0	12·0
Threadworms ...	2·7	4·4	2·4	1·6
Strongyloides ...	5·1	8·3	3·6	3·2
Gastrodiscus hominis	3·2	7·3	2·4	0·8
Fasciolopsis buskii ...	2·1	3·9	2·0	1·3

Battalion 1 had been in Shillong about 2 years, Battalion 2 about 6 months. Gastrodiscus was recovered from the stools collected after thymol in a large number of the 56 cases in which eggs were found, and *Fasciolopsis buskii* was "quite common." In four cases there were found ova of *Heterodera radicicola* and in three onchospheres of *Bertiella satyri*, all among civilians. There was one case of *Taenia saginata* in a Gurkha.

C. L.

Labernadie (V.) & Devata-Soupramanien. Les helminthiases à Pondichéry. [**Helminth Infestation at Pondichéry.**]—*Ann. de Méd. et de Pharm. Colon.* 1930. Apr.–May–June. Vol. 26. No. 2. pp. 257–258.

By an unstated method 1,088 stools were examined. The numbers of infections were : ascaris 469, hookworms 367, trichuris 381. In all, 765 stools contained eggs.

C. L.

Gambier (A.). Parasitisme intestinal au Cambodge. [**Intestinal Parasites in Cambodia.**]—*Bull. Soc. Path. Exot.* 1930. Oct. 8. Vol. 23. No. 8. pp. 790–792. [1 ref.]

The stools of 700 prisoners were examined by means of two smears ; 564 contained parasites : ascaris 310, ankylostomes 229, trichuris 87. Strongyloides was reported 4 times, always in multiple infections of which there were 177. Other infections found were giardia 18, *Taenia saginata* 6, *T. solium* 1, enterobius 2. Balantidium was absent.

C. L.

Sautet (J.). Parasitisme intestinal et éosinophilie sanguine chez les Indochinois. [**Intestinal Parasites and Eosinophilia in the Indochinese.**] —*Bull. Soc. Path. Exot.* 1930. Oct. 8. Vol. 23. No. 8. pp. 792–795. [1 ref.]

Sautet examined 55 persons by the method of de Rivas (this *Bulletin*, Vol. 25, p. 447) with these percentage results : Trichuris often present, ascaris less frequently—14·5, ankylostomes 36·3, strongyloides 3·6, *Clonorchis sinensis* 34·5. *F. buskii* eggs were not seen. High eosinophilia was found with low infection. No relation was traced between heavy parasitism and anaemia.

C. L.

Gopsill (W. L.). **An Investigation of Helminthic Infection in the Lower Shire District.**—*Nyasaland Protectorate Ann. Med. Rep. on Health & San. Condition for Year ending 31st December, 1929.* Appendix III. pp. 43–44.

Smears examined after gravity precipitation for 30 minutes showed eggs of hookworms 74·2 per cent., ascaris 12·2 per cent., *S. mansoni* 20 per cent. and *S. haematobium* 1 per cent. in 500 cases. Other infections such as trichuris or clonorchis were found five times. Ascarids were passed by persons treated for hookworms after no ascaris eggs had been found in the faeces. An attempt is being made to start latrines.

C. L.

i. Schwetz (J.) & Baumann (H.). Observations helminthologiques sur les noirs de l'âge scolaire dans l'agglomération de Stanleyville (Congo Belge). (Mai 1928–février 1929.) [**Helminths of Native School Children at Stanleyville.**]—*Ann. Soc. Belge de Méd. Trop.* 1929. Dec. 31. Vol. 9. No. 4. pp. 307–317. [Parasit. Lab., Stanleyville.]

ii. —— & ——. Note sur l'efficacité de la thérapeutique des helminthes courants (ankylostomes et ascaris) dans un milieu très infecté. [**Efficacy of Treatment of Common Helminths.**]—*Ibid.* 1930. Mar. 31. Vol. 10. No. 1. pp. 107–111. [1 ref.] [Parasit. Lab., Stanleyville.]

i. Examination was by a smear of faeces diluted in saline, and it is noted that the figures are only approximate and indeed the result of sheer chance. The number of scholars examined was 952 and 60 per cent. were found infected, the individual percentages being : with ankylostomes 41·4, ascaris 28·2, trichuris 3·2, *S. haematobium* 3·5, *S. mansoni* 1·1, strongyloides 3·6, enterobius 0·2, *T. saginata* 0·1 and flagellates 0·7. It is particularly remarked that eggs are very few when there is intestinal illness.

ii. A further report on 109 pupils of 2 schools. They were treated anthelmintically at the end of 1928, but not examined then. Pupils in these schools (mostly not the same pupils) were examined in October, 1929, and treated with 1 to 3 cc. of carbon tetrachloride if hookworms were present, and with santonin 5 to 15 cgm. if they were not but if other parasites, generally ascaris, were. The children were then re-examined. In the pure ankylostome cases which were detectable by a simple smear, infections fell from 29 to 16, in pure ascaris cases from 14 to 12, in mixtures of the two infections from 14 to 3. Of 5 cases found negative in 1928, 2 were found positive in 1929. In spite of the method of diagnosis used, these are considered as new infections.

C. L.

Le Gac (P.). L'helminthiase chez les Lobis (A. O. F.). [**Helminthiasis among the Lobis (French West Africa).**]—*Bull. Soc. Path. Exot.* 1930. July 9. Vol. 23. No. 7. pp. 727–731.

Le Gac has been unable to avail himself of methods of straining or concentrating faeces and has used two smears from each stool. In these conditions he has discovered in 224 persons 101 with parasites—ankylostomes 67, ascaris 45, strongyloides 4, *Hymenolepis nana* 1. Multiple infections were rare.

C. L.

Aguessy (Dominique). Parasitisme intestinal dans le cercle de Djougou (Dahomey). [**Intestinal Parasites in Dahomey.**]—*Bull. Soc. Path. Exot.* 1930. Oct. 8. Vol. 23. No. 8. pp. 859–862.

A single diluted smear from each of 950 children's stools obtained at a flat mercenary rate of a sou for every *ex tempore* stool showed 675 or 71·05 per cent. to be parasitized. Detailed percentages were: ankylostomes 69·6, ascaris 12, enterobius 2·2, trichuris 3·3, *S. mansoni* 0·5, *T. solium* 0·4, flagellates 0·19.

C. L.

Ranjeva (J. B.). Parasitisme intestinal à Farafangana. [**Intestinal Parasitism at Farafangana (Madagascar).**]—*Ann. de Méd. et de Pharm. Colon.* 1930. Jan.–Feb.–Mar. Vol. 28. No. 1. pp. 85–89.

Of 560 persons examined by an unstated method, 520 showed in the faeces evidence of parasitism, namely ascaris 272, ankylostomes 3, threadworms 5, trichuris 230, *S. mansoni* 9, *T. solium* 1.

C. L.

Schapiro (Louis) & Cort (W. W.). **A Study of the Relation of the Dry Season to the Level of Helminth Infestation in a Panama Village.**—*Amer. Jl. Hyg.* 1930. Nov. Vol. 12. No. 3. pp. 699–708. [12 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore.]

"Examinations by the dilution egg counting method were undertaken in Dolega, Chiriqui Province, Panama, to test the relation of the dry season to the level of helminth infestation. The rainfall of this region is over 100 inches a year and the yards of this village were densely shaded. A preliminary examination of 213 out of a population of 539 showed a very heavy hookworm infestation of the type found in the uplands of Panama, a rather low ascaris count and one of the heaviest trichuris infestations ever recorded by the egg counting method. Two series of counts of 100 individuals were made about two months after the end of the rainy season and two more at about the same period after the end of the dry season. The close correspondence of these check counts indicated that the egg counting technic used was uniform throughout the time of the studies. A comparison of the average of the post-rainy season counts with that of the post-dry season series showed an increase for hookworm, ascaris and trichuris. In all three cases this increase was entirely due to great increases in a very small number of cases (five for hookworm and two each for ascaris and trichuris). The results indicate at least no reduction in the level of infestation for any of the three worms over the four months of the dry season. To what extent this is due to reinfection during the course of the dry season and how much to persistence over this period of worms already present cannot be certainly determined."

[By "the dilution egg counting method" is meant "the small drop and displacement options of the Stoll egg counting method."]

C. L.

Otto (G. F.) & Spindler (L. A.). **Effect of Partial Sanitation on Infestation with Intestinal Parasites in Southwest Virginia.**—*Southern Med. Jl.* 1930. June. Vol. 23. No. 6. pp. 556–560. [12 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore.]

The introduction of pit privies "has apparently been effective in reducing the hookworm incidence . . . [but] has apparently done little to control the ascaris burden." This is attributed in part to the fact that small children are too frightened of falling through the hole to use

the pit privy, and adults " feel that it produces an unwise accumulation of odorous and obnoxious waste which if daily dropped in various parts of the yard would be destroyed by insects or chickens and washed into the soil by the rains." The problem is " the slow process of educating these people to consider the sanitary privy as one of the most necessary buildings on the premises of every family." [Evidently these people do not consider a pit privy a sanitary one. Are they blameworthy?]

C. L.

Odessaer Medizinische Zeitschrift. 1930. Vol. 5. No. 1/2. pp. 1–186. **Fourteen papers on Helminthiasis.** [In Russian script. German summaries.]

In 4,478 persons examined in Odessa, probably by faecal smear, these percentages of infection were found : any parasites 75·9, trichuris 71·5, ascaris 10·9, enterobius 10·4, *Hymenolepis nana* 6.3, hookworms 0·6, tapeworms 0·8. Sex caused no difference. *H. nana* reached its maximum of 12·9 in those from 5 to 10 years old. In children's communities (Kinderstädtchens) the total infection reached 99·5 per cent., that of trichuris being 97·7 and of *H. nana* 18·4. In the red army 57·1 per cent. of 722 persons had intestinal infections established. Rice fields may spread infection. Alterations in the blood are considered. The diagnostic methods of Fülleborn, Telemann and the simple faecal smear gave, in the grade of infection actually present, positive percentages of 75, 52 and 8 respectively. Enterobius infected persons had eggs under the finger nails to the extent of 87·8 per cent. ; the disabilities caused by the infection are indicated. In saturated salt solution and collection by Fülleborn's method, hymenolepis and trichuris eggs sink after some days, ascaris eggs may be found 6 to 12 hours after an initial failure to do so, and float for months. Enterobius eggs have all sunk in 72 hours. The periphery of the surface should be examined rather than the centre.

C. L.

i. Smirnow (G. G.). Der Infektionsgrad der einheimischen und fremden Bevölkerung von Tadshikistan mit parasitischen Würmern nach den Angaben der helmintho-koprologischen Untersuchung in der Stadt Düschambe im Jahre 1928. [**Helminth Parasites of Population of Tadshikistan.**]—In " Die tierischen Parasiten und einige parasitäre Krankheiten des Menschen in Tadshikistan " [Pawlowsky (E. N.), Edit.]. Leningrad. 1929. pp. 143–162. With 21 text figs. [21 refs.] [In Russian. German summary p. 163.]

ii. Paradoksow (L. F.). Zur Frage ueber die Echinococcuskrankheit bei der Bevölkerung von Tadshikistan.—*Ibid.* pp. 163–167. [7 refs.] [In Russian. German summary p. 167.]

iii. Pawlowsky (E. N.). Die Bedeutung der durch Eingeweidewürmer hervorgerufenen Invasionen überhaupt und der Verbreitungswege derselben im Zusammenhang mit der Lebensweise der Tadshiken.—*Ibid.* pp. 168–185. With 1 text fig. & 4 plates. [27 refs.] [In Russian. German summary p. 185.]

i. Of 408 persons whose faeces were examined by a method unstated in the summary, infection percentages in Dushambe and in Tadshikistan were respectively : for trichuris 43·87 and 62·4, ascaris 18·38 and 27·51, enterobius 3·67 and 1·93, hymenolepis 4 and 0·77, and *T. saginata* 1·33 and 0·38.

ii. Of 1,651 inmates of the Dushambe hospital hydatid occurred in 5.

iii. These conditions are attributed to impure water, primitive latrines, fouling of the soil, the proximity of latrines to vegetable gardens, primitive cooking arrangements, and other habits.

C. L.

i. Schjenti (A.). Ankylostomidosis in Mingrelien, Gurien und Imeretien (nach den Ergebnissen der Expedition vom Jahre 1928). [**Ankylostomiasis in Georgia.**]—*Nachrichten der tropischen Medizin.* Tiflis. 1930. May–June. Vol. 3. No. 1. pp. 41–52. [In Georgian script. German summary pp. 97–98.]

ii. Jankoschwili (W.) & Karibow (N.). Die Rolle der roh genossenen Gemuese in der Verbreitung der Helmintiasis zwischen der Bevoelkerung der St. Tiflis. [**The Rôle of Raw Vegetables in the Spread of Helminthiasis at Tiflis.**]—*Ibid.* pp. 53–59. [4 refs.] [In Georgian script. German summary p. 98.]

iii. Swanidse (D.). Ueber die Verbreitung der *Hymenolepis nana* und *Hymenolepis diminuta* unter den Kindern der Tifliser Kindergaerten. [**The Spread of** *H. nana* **and** *H. diminuta* **among Children in Tiflis Schools.**]—*Ibid.* pp. 60–68. [In Georgian script. German summary p. 99.]

i. Three districts in West Georgia were examined in 1928 with this result. In Mingrelien 15 villages, 1,528 persons, maximum hookworm infections per village 76·8, minimum 14·7, average 65·35. In Gurien the figures are 10, 1,416, 50, 24·1, 41·51 ; and in Imeretien 7, 1,076, 90, 80·1, 83·6. Haemoglobin in infected persons varied from 11 to 80, average 45. Geophagy was considerable. The diagnostic method is unnoted in the summary.

ii. There were investigated 11,665 grams of vegetables with recovery of 282 worm eggs, 111 being those of man's parasites, 141 worm larvae, 326 insects in imago, larva or egg. Of the 111 worm eggs 100 were enterobius, 7 ascaris, 2 hookworm, 1 trichuris, and 1 taenia onchosphere.

iii. The investigation covered 1,300 children between 2 and 8 years, 87 per cent. being positive to eggs of parasites in the faeces. Detailed percentages are : trichuris 78, ascaris 41·3, *H. nana* 14·1, *E. vermicularis* 3·6. Actual figures for others are : hookworms 6, trichostrongyles 6, *H. diminuta* 4, *Taenia saginata* 2. The method of diagnosis is unstated in the summary.

C. L.

Hakki (Ismail). Ueber Darmparasiten in der Türkei. [**Intestinal Parasites in Turkey.**]—*Zent. f. Bakt.* I. Abt. Orig. 1930. May 15. Vol. 116. No. 6/8. pp. 516–518.

The numbers examined were 600, the technique smears plain and stained. The numbers of infections were : ascaris 223, trichuris 101, hymenolepis 53, " necator " 2, enterobius 41, diphyllobothrium 6, *T. saginata* 1, dipylidium 1. The percentages of protozoa found were *E. histolytica* 3·8, four-celled amoebic cysts 8·2, giardia 4·0, tetramitus 2·0, trichomonas 3·9. Coccidia, balantidia and spirochaetes were not found.

C. L.

HALL (Maurice C.). **Arthropods as Intermediate Hosts of Helminths.**—*Smithsonian Miscellaneous Collections.* 1929. Sept. 25. Vol. 81. No. 15. 77 pp.

Hall has here produced a valuable catalogue of the insects implicated in the literature as secondary hosts to cestodes, trematodes, nematodes and acanthocephalids, with the object of aiding the student and encouraging co-operation between helminthologists and entomologists.

C. L.

HALL (Maurice C.). **Treatment for Infestations of Man with Parasitic Worms.**—*U.S. Nav. Med. Bull.* 1930. July. Vol. 28. No. 3. pp. 553–569.

Of this lecture given at the Naval Medical School, Hall said: "It must be kept in mind that some things which may be said may be true and yet may call for an extended discussion . . . to prevent them being misunderstood or giving the effect of a half truth." An abstract of such a paper must be unsatisfactory. For ascaris oil of chenopodium in adult dose of 1 cc. is advised. As purgative Hall prefers castor oil, never less than one ounce, but if salts are given not a saturated but a third-saturated solution. After 4 hours there must be a second aperient —salts—if the bowels have not acted, to be repeated if necessary four hours later with an enema. Santonin, gr. v, with an equal quantity of calomel should be substituted for chenopodium if there is gastro-enteritis, debility, fever, or pregnancy.

For hookworms carbon tetrachloride in dose of 3 cc. with a saline, avoiding alcohol, fat and meat, the contra-indications being alcoholism, gross ascariasis and a low ionized blood calcium content. Tetrachlorethylene in doses of 3 to 4 cc. is mentioned. Chenopodium of fixed ascaridole content is advised in doses of 2 cc., but the dose of ascaridole aimed at is not disclosed.

For hookworms and ascaris in mixed infections a dose of 3 cc. of 1 part of chenopodium to 2 or 3 of carbon tetrachloride or tetrachlorethylene.

For trichuris 30 cc. of leche de higueron once or for 3 successive days followed by a saline, or santonin as for ascaris. For threadworms it is believed that the relatively insoluble tetrachlorethylene will prove valuable. For tapeworms pelletierin, carbon tetrachloride or male fern. For filariae no treatment is established, for dracunculus a pound of sugar a day or 4 increasing doses of novarsenobenzol have been advised. For schistosomes the usual tartar emetic or emetine. For fasciolopsis carbon tetrachloride or 4 gm. of B-naphthol, remembering its risks. For strongyloides, trichinosis, clonorchis, paragonimus and somatic taeniasis no drugs are definitely beneficial.

C. L.

i. DA COSTA (S. F. Gomes). Action de l'acide oxyacétylaminophénylarsinique sur l'*Ascaris lumbricoides* du porc. [**Action of Organic Arsenicals on Various Helminths.**]—*C.R. Soc. Biol.* 1930. Feb. 7. Vol. 103. No. 5. pp. 339–342. With 2 text figs. [5 refs.]

ii. ——. Action de l'acide oxyacétylaminophénylarsinique sur *Taenia serrata* et les Ankylostomidés du chien.—*Ibid.* pp. 342–344. With 2 text figs. [1 ref.]

iii. DA COSTA (S. F. Gomes). Action des arsénobenzènes sur les helminthes de l'intestin.—*Ibid.* 1930. May 1. Vol. 103. No. 14. pp. 1257–1259. With 1 text fig. [1 ref.]

iv. ——. Action anti-helminthique des dérivés de l'acide oxyacétylaminophénylarsinique et des arsénobenzènes, obtenus par injection intraveineuse de ces composés.—*Ibid.* pp. 1260–1261. [1 ref.]

v. ——. Action de l'acide oxyacétylaminophénylarsinique et des arsénobenzènes sur les helminthiases des chiens.—*Ibid.* pp. 1262–1263.

This work forms an interesting addition to the evidence that certain anthelmintics are in themselves inactive, but become effective after the host has altered them into something else. The worms were tested in a Rhode-Saito solution, modified or unmodified.

i. *Ascaris lumbricoides* from the pig was quite unaffected by a 10 per cent. solution of stovarsol or spirocid, in striking opposition to reports which have been published as to its anthelmintic value. Muscular tissue of worms was equally undisturbed by the gastro-intestinal contents of fasting dogs. When, however, the test took place in a solution of this salt in this same gastro-intestinal fluid, or in this fluid obtained from dogs who had been given 1 gram of stovarsol by mouth an hour earlier, there occurred marked, often immediate, paralysis. Moreover, the blood from the animals fed previously with stovarsol was also active against ascaris. On the other hand mixtures of stovarsol with pepsin, trypsin, faeces, bile, or liver did not give corresponding results.

ii. This drug produced in a 1 per cent. solution a gradual temporary cessation of movement in *T. serrata* ; the intestinal fluid of dogs fed an hour earlier with 1 gm. of stovarsol produced definite paralysis in 15 to 45 minutes after an initial stimulation. On *Uncinaria stenocephala* the unaltered drug was inactive. The intestinal contents an hour after taking 1 gm. of the drug produced a lessening of muscular contraction, but to obtain a result as effective as on taenia it had to be given in double or treble the strength.

iii. Arsenobenzol and novarsenobenzol in 0·4 per cent. solution in Rhode-Saito fluid are inactive against ascaris and *T. serrata*, but if the intestinal contents of dogs treated by mouth an hour earlier with one of these drugs are mixed with Rhode-Saito fluid and placed in the thermostat for 3–18 hours at 37° C., the mixture immediately paralyses ascaris and produces lessening of the contractions of the taenia. The conclusion is that these compounds become anthelmintic only after being transformed in the gastro-intestinal tube.

iv. By injecting stovarsol or neosalvarsan intravenously into dogs it was found that after an interval of 60 to 90 minutes for the latter and 90 to 120 minutes for the former the blood becomes very active against ascaris and less so against *T. serrata*, the activity being lost after some hours. It is concluded that the anthelmintic product does not represent the final change produced in the circulation on the organic arsenicals ; but no evidence is offered as to whether they have not meanwhile been excreted by kidney or bowel.

v. As regards anthelmintic effect of these drugs as checked by autopsy, the heads of *T. serrata* have never been expelled ; on ascaris the

effects have been greatest with novarsenobenzol, namely 65 per cent., the other drugs being active in this order, stovarsol, spirocid, arsenobenzol.

C. L.

Nag (S. C.). **Notes on the Use of Carbon Tetrachloride.**—*Indian Med. Gaz.* 1929. Dec. Vol. 64. No. 12. p. 683. [Barbheel Tea Estate Hosp., Bargang P.O., Tezpur, Assam.]

The drug was obtained from Merck & Co. The dose was minims 60 [4 cc.] for an adult given fasting, followed by magnesium sulphate ½ to 1 oz. [16 to 32 gm.] half to one hour later. In children it was minims x at 1 year old with minims ii added for each year. [2 cc. for a child of 11.] In Series 1 comprising 342 adults, 5 females showed 2 to 4 hours after administration slight fever, vomiting, coated tongue, restlessness, jaundice, very high coloured and scanty urine, giddiness and sometimes slight delirium. One passed roundworms and after 4 days incessant vomiting was given oil of chenopodium and a purge and recovered, whether with further passage of ascarids or not is unstated. Series 2 comprised 289 children between 3 and 11 years of age. Four had symptoms resembling the above, but urine was actually suppressed in 2. Three died. No post-mortem examinations were permitted. [Nag has courageously published his cases, a contrast to the silence which hid the earlier Assam deaths.]

C. L.

Okano (Masatoshi). Studien ueber die Schädigung der Leberfunktion durch Tetrachlorkohlenstoff. [**Injury to Liver Function by Carbon Tetrachloride.**]—*Japan Jl. Med. Sci. IV. Pharmacol.* 1930. Mar. Vol. 4. No. 2. pp. 167–188. [63 refs.] [Pharmacol. Inst., Imperial Univ., Tokyo.]

The experimental animals were rabbits, the doses very large—0·1 to 1·4 cc. corresponding to about 12 to 42 cc. for a man of 70 kilos. Many died in 2 to 4 days. There was a trace of albumin after 1 to 2 days and an increase of serum esterase* which fell to normal in 4 to 7 days. Total nitrogen and ammonia in the urine were increased, the latter parallel with the serum esterase. The amount of urea and allantoins in the urine was lessened, that of amino acid is increased. The effects were the same in fed and starving dogs, and the blood sugar fell in both. Injection of 1·5 to 2 gm. of glucose per kilo did not protect the liver against central fatty degeneration of a high grade. Necrotic change was found in the kidneys also.

C. L.

Sharp (Elwood A.). **The Relation of Toxicity to Dosage of Tetrachlorethylene (C_2Cl_4).**—*Jl. Trop. Med. & Hyg.* 1930. Nov. 15. Vol. 23. No. 22. pp. 336–339. [16 refs.] [Dept. of Exper. Med., Parke, Davis & Co., Detroit.]

The literature is surveyed, and short notes given regarding 96 patients under 3 different medical men. One who treated 21 patients recorded

* Esterase is an enzyme which hydrolyses an ester, splitting it up into the parent alcohol and acid.

untoward phenomena in 11. The other medical men recorded only 4 between them. It is suggested that if the drug is absorbed at all, its low toxicity produces only a fleeting and innocuous intoxication in a few hypersensitive persons [see however KENDRICK, this *Bulletin*, Vol. 27, p. 420] and that higher single doses are possible. Of the 11 patients who were re-examined by an unstated diagnostic technique from 5 days to 3 weeks after treatment three were still positive.

C. L.

ZSCHUCKE (Johannes). Therapeutische Versuche mit Ascaridol. [**Treatment Experiments with Ascaridole.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Sept. Vol. 34. No. 9. pp. 472–480. [23 refs.]

The vermicidal effect of ascaridole was determined (1) by giving ascaridole, and later some other vermifuge repeated as often as four times till no more worms were passed, since Zschucke has found that using Willis's direct gravity flotation method he could not be sure that no eggs meant no worms, (2) by counting by Stoll's method the number of eggs before and 12 days after treatment, it being explained that it is used not because it is better than D.C.F. but because it is more fashionable. Apart from the vermicidal effect judged by the number of worms, the vermitoxic effect was measured—that is to say the extent to which counts soon after treatment fail to show eggs when they or worms are afterwards passed. Ascaridole followed by a saline was given (Ia) to 12 cases once, generally in doses of 0·9 gm. for a man of 60 kilos., (Ib) to 11 cases in the same individual doses but given twice, (Ic) to 6 cases in an average dose of 1 gm. per 60 kilos. In a second series there was administered castor oil with 2·5 per cent. of ascaridole ; the dosage of the latter lay between 0·0161 and 0·0213 gm. per kilo, the average (and usual) quantity being 0·018 gm. given once (IIa) or twice (IIb). [The gram and the cc. are practically identical for ascaridole.] The effects for hookworm and ascaris are given in the table :

	Vermicidal Effect (worm counts).	Vermicidal and Toxic Effect (egg counts).	Cured.
1. Hookworm :			
Series Ia	70% (12 cases)	86% (12 cases)	17%
Series Ib	81% (11 cases)	97% (11 cases)	36%
Series Ic	56% (6 cases)	93% (6 cases)	17%
2. Ascaris :			
Series Ia	62% (10 cases)	69% (9 cases)	20%
Series Ib	81% (9 cases)	86% (9 cases)	56%
Series Ic...	63% (5 cases)	83% (5 cases)	80%

	Vermicidal Effect (worm counts).	Vermicidal and Toxic Effect (egg counts).	Cured.
1. Hookworm :			
Series IIa	91% (14 cases)	89% (13 cases)	54%
Series IIb	98·4% (8 cases)	89% (7 cases)	86%
2. Ascaris :			
Series IIa	98% (12 cases)	100% (12 cases)	92%
Series IIb	97% (8 cases)	100% (8 cases)	88%

No toxic effects were noted. After one dose of ascaridole the proportion of males to females expelled was 1 to 5·3, of those remaining 1 to 2·5 ; after two doses 1 to 8 and 1 to 2·3.

C. L.

Hassan (A.) & El Din (M. Salah). **Investigations on the Oil of Chenopodium and its Anthelmintic Action.**—*Jl. Egyptian Med. Assoc.* 1930. July. Vol. 13. No. 7. pp. 271–281. [8 refs.] [Public Health Labs., Cairo.]

The work confirms that of Smillie and Pessoa, of Paget, and of Knafellenz and Hofmann that ascaridole is the active and toxic principle of oil of chenopodium and that Paget's method of measuring its amount in the oil is satisfactory.

C. L.

Schwartz (A.), Azam (A.) & Yovanovitch (M.). Le traitement des parasitoses intestinales par le benzo-méta-crésol. [**Treatment of Intestinal Helminth Infestations by Benzometacresol.**]—*Presse Méd.* 1930. Apr. 9. Vol. 38. No. 29. pp. 485–486.

The authors state that chemically pure benzo-metacresol is absolutely harmless but a powerful anthelmintic in adult doses of 4 to 5 grams given on 4 or 5 consecutive days, and that several such courses are required to remove any parasites present. No details are given.

C. L.

da Costa (S. F. Gomes). Sur l'action anti-helminthique de la gomme-gutte. [**Anthelmintic Action of Gamboge.**]—*C.R. Soc. Biol.* 1930. Feb. 7. Vol. 103. No. 5. pp. 345–347. With 3 text figs.

The gum resin of *Garcinia* species, whose active principle is gambogic acid, a drastic purge, produces only a slight paresis in *A. lumbricoides* in a strength of 5 per mille. In *Taenia serrata* there is paralysis in 10–20 minutes, following a phase of excitation. On *U. stenocephala* the effect is slight.

C. L.

Cawston (F. G.). **Toxic Reactions in Antimony Therapy.** [Correspondence.]—*Jl. Med. Assoc. South Africa.* 1930. Oct. 11. Vol. 4. No. 19. p. 607. [2 refs.]

"Not only to avoid inconvenience to young patients, but in order to prevent the occurrence of hepatitis, every effort should be made to avoid both coughing and vomiting by skilful regulation of the doses employed in the treatment of bilharzia disease."

C. L.

Senevet (G.) & Champagne (R.). A propos d'un cas de distomatose à *Fasciola hepatica.* [**Case of *F. hepatica* Infestation.**]—*Arch. Inst. Pasteur d'Algéric.* 1929. June. Vol. 7. No. 2. pp. 207–216. [2 refs.] [Pasteur Inst. of Algeria, Algiers.]

The authors collect from the literature 103 cases in which *F. hepatica* was found in man, and gave in a certain number of them the references.

Yet another case is added ; it showed abdominal, especially hepatic, pain, urticaria, eosinophilia of 30 per cent. and yellowish operculated eggs in the stool averaging 137 μ by 80 μ as well as those of trichuris. The liver was enlarged but not tender, and at one time the man became subicteric. Thymol, 2 gm., expelled no worms, nor did male fern. A course of stovarsol in increasing doses from 0·25 gm. to 1 gm. relieved symptoms and lessened eggs, but did not disinfest.

There have now been six cases of this infection reported from Algeria, four within the last six years, so that the infection is probably commoner than is generally suspected.

C. L.

Giordano (Mario) & Gelli (Giuseppe). Contributo allo studio della distomatosi epatica nell'uomo. (Prima osservazione in Italia di distomatosi da *Fasciola hepatica.*) [**Case of Fasciola Infestation in Man.**]—*Arch. Ital. Sci. Med. Colon.* 1930. Jan. 1. Vol. 11. No. 1. pp. 5–10. With 1 text fig. [28 refs.] English summary (8 lines) p. 11. [Inst. of Colonial Path., & Inst. of Clin. Pediatrics, Univ., Bologna.]

"A description of the first case in Italy of infection caused by *Fasciola hepatica* in human beings. The patient was a girl of 11 years of age taken into hospital suffering from anaemia and decline. The examination of faeces showed the presence of the eggs of *F. hepatica,* from which, when placed in water, a miracidium escaped. The patient lived in the country in the Prov. of Bologna, a locality where distomatosis is widely diffused among animals. A repeated treatment of Male Fern caused the eggs to diminish gradually and produced an improvement in the general condition of the patient."

C. L.

Scriabine (K. I.), Podyapolskaya (B. P.) & Statirova (N. A.). [Contribution à la caractéristique de la fasciolopsiose de l'intestin et sur son agent pathogène.] [**Fasciolopsis Infection.**]—*Russian Jl. Trop. Med.* 1929. Vol. 7. No. 4. pp. 262–278. With 3 figs. on 2 plates & 1 text fig. [29 refs.] [In Russian.]

A case of infection with *Fasciolopsis buskii* is described and the opportunity is taken to discuss the status of other species of this genus, The patient, a Chinese girl 6 years old, had been resident in Moscow for about half a year when her condition was recognized at the Tropical

Institute. According to the parents, the child while in China suffered from pains in the abdomen and chronic diarrhoea since the age of two. She was treated with thymol followed by sodium sulphate, and about 200 specimens of *F. buskii* were discharged with the faeces. The freshly isolated parasites were flesh-coloured and had the appearance of bits of raw meat. After remaining for some time in water or in 70 per cent. alcohol they became decolorized. Unfixed fresh specimens measured 34–38 mm. by 18–20 mm. In specimens fixed in alcohol and compressed, the measurements were 32–56 mm. by 15–22 mm. The stools contained numerous eggs which had a superficial resemblance to those of *Fasciola hepatica*. They were of a uniform light-grey colour and varied considerably in size and in shape (0·1296–0·2112 by 0·072–0·0912 mm.). Attention is drawn to a new distinctive character in the eggs of *F. buskii* : on the pole opposite to the operculum there is a small thickening of the membrane which is either median or asymmetrical ; this structure is said to be homologous to the processes on eggs of other trematodes.

The authors discuss the systematic position of other species of *Fasciolopsis* and conclude that *F. rathouisi* and *F. fülleborni* are identical with *F. buskii*, while the question of *F. goddardi* and *F. spinifera* is left open. A critical review is given of the case of *F. buskii* infection recorded by Semionow and Garmotty (this *Bulletin*, Vol. 24, 1927, p. 982) ; the authors believe that the parasite was *Fasciola hepatica*. The present case is therefore the first to be recorded in Russia, though the infection was probably contracted in China. The paper has some excellent figures of the anatomy of the worm (fig. 1), of specimens deformed by thymol (fig. 2), and illustrating variations in the eggs (fig. 3).

C. A. Hoare.

Minami (Seigo) & Sato (Takashi). Hautgeschwülste durch Lungendistoma (*Paragonimus westermani*). [**Skin Tumours caused by Paragonimus.**]—*Arb. a. d. Med. Univ. Okayama.* 1930. Aug. Vol. 2. No. 1. pp. 78–88. With 6 text figs. [Skin Clinic, Univ., Okayama.]

Two children of 7 were given raw juice of the crab, *Potamon dehaanii*, a domestic remedy for whooping cough and intermediate host of *P. westermanii*. Bloody sputum followed and thoracic swelling from which paragonimus adults were recovered. The flukes so removed had reached the deep dermis or the subcutaneous tissue.

C. L.

Nishiyama (Iori). [**Study of a Lung Fluke** (*Distoma pulmonale*) **found among School Children in Shizuoka Prefecture and of its Intermediate Host.**]—*Jl. Public Health Assoc. Japan.* 1929. July. Vol. 5. No. 7. [In Japanese. English summary pp. 3–4.]

This Japanese prefecture is large and only those with a history of spitting of blood " were examined of their sputa and stools, and as the result out of 80,144 persons 953 were found to be suffering from the disease." About 53·5 per cent. spat blood for 3 days only ; 3·6 per cent. did so for more than 3 years. When the sputum contained blood ova were always found ; when it was transparent this was so in 3·9 per cent. only. Lung symptoms in positive cases were very slight, and insufficient for diagnosis. Tuberculosis is not mentioned in the abstract.

C. L.

Goodwin (T. S.). *Paragonimus westermanii* **Infection. Case Report.**—*China Med. Jl.* 1930. June. Vol. 44. No. 6. p. 568.

" A case of Paragonimiasis is reported, in which the signs and symptoms disappeared almost immediately on pushing the administration of emetine to the limit of tolerance."

C. L.

Khaw (O. K.). **Remarks on the Species of Paragonimus, with Special Reference to the Questions of their Identity and Distribution.**—*Nat. Med. Jl. China.* 1930. Feb. Vol. 16. No. 1. pp. 93–102. With 2 text figs. [37 refs.] [Union Med. College, Peking.]

A valuable survey of the literature.

C. L.

Ochi (Sigeru). Experimentelle Untersuchungen ueber die Widerstandsfähigkeit der encystierten Cercarien von *Heterophyes heterophyes*. [**Resistance of the Encysted Cercariae of** *H. heterophyes*.]—*Okayama-Igakkai-Zasshi* (*Zent. d. Okayama Med. Gesellsch.*). 1930. Mar. Vol. 42. No. 3. pp. 617–626. [13 refs.] [In Japanese. German summary p. 627.] [Inst. for Ship & Trop. Diseases, Kobe.]

Encysted cercariae live for 13 hours in *soja* sauce, 24 hours in vinegar, 48 hours in *miso*, 36 hours in sour *miso*, and 4 days in 5 per cent. salt solution. A 10 per cent. salt solution kills in 4 days and a saturated salt solution in 2. Infectivity is lost if the fish is plunged in boiling water for 20 seconds, in water at 80° C. for 3 minutes, or at 50° C. for 7 minutes ; but remains after the fish has been iced for 8 days. Cercariae isolated from the fish remain alive from 3 to 7 days in fresh water, from 4 to 7 days in sea water, and after 18 hours in active gastric juice.

C. L.

Takahashi (Shozo). **On the Life-History of** *Metagonimus yokogawai*, **a New Species of Metagonimus and** *Exorchis major*.—*Okayama-Igakkai-Zasshi* (*Zent. d. Okayama Med. Gesellsch.*). 1929. Dec. Vol. 42. No. 12. pp. 2687–2753. With 58 figs. on 9 plates. [44 refs.] [In Japanese. English summary pp. 2754–2755.] [Bact. Dept., Med. Univ., Okayama.]

Suzuki having held that the accepted species *Metagonimus yokogawai* really contains a second species having large eggs, Takahashi working under his guidance has divided cercariae found in the liver of *Thiara* (*Melania*) *libertina* into three species. One encysts readily in the fins [and] scales of *Plecoglossus altivelis* and develops into *M. yokogawai*. The second encysts readily in the gold fish, *Carassius auratus*, and becomes the adult worm of the " large egg type of Metagonimus " which is held to differ from other species of the genus by the close approximation of the posterior ends of the vitellaria and by the larger eggs which average 0·033 by 0·021 mm. ; but it is not named in the summary. The third encysts in *Carassius auratus* and develops into *Exorchis major*.

C. L.

i. Khalil (M.). **The Rôle of the Nile in the Dissemination of Snail Intermediate Hosts of Schistosomiasis in Egypt.**—*Jl. Egyptian Med. Assoc.* 1930. Apr. Vol. 13. No. 4. pp. 137–143. [7 refs.] [Research Section, Public Health Offices, Cairo.]

ii. ——. **Discussion on the Nile as a Source of Bilharzia in Egypt, at the 2nd Annual Congress of the Egyptian Medical Association held at Alexandria on 21st May 1929.**—*Ibid.* pp. 144–145.

i. The investigation starts from certain statements for which Leiper's authority is quoted.

" Leiper in 1918 claimed that the main source of Bilharzia infection is the small canals and drains where the snails abound. The Nile may be a source of infection by infected water passing into it from drains and canal escapes in Upper Egypt. . . .

" In 1929, in his official Report on Bilharziasis submitted to the Egyptian Government he again insisted on the freedom of the large canals and the Nile from the snail carriers of Bilharziasis and he further claimed that the few snails found in them have migrated backwards from the small tertiary canals against the current. The importance of this statement will be appreciated from the recommendation that all measures of prevention of Bilharzia directed against the Molluscan host will be confined to the tertiary canals and drains only. The Nile and the large canals are considered safe according to this opinion."

Khalil states confidently that in 1928 all Bullinus snails were " completely exterminated " in the isolated irrigation region of Wardan, comprising 600 acres on the west of the Delta, by making of the entering water a solution of copper sulphate of the strength of 1 in 200,000. A few months later Bullinus snails were again present, some being also found on weeds caught by the pillars of a wooden bridge at the entrance of the canal. This possibility of re-establishment of snails from the Nile, then apparently realized, led to the discovery that 25 per cent. of children who had never left the island of Roda (in which there are no canals or drains and which lies in the Nile opposite Cairo) were infected with *S. haematobium*, while living Bullinus were found on its shores. Next it is claimed as being established by survey that no drains or tributaries enter the Nile south of the Assuan dam, while traps in the shape of boxes attached to buoys south of the dam collected *Bullinus contortus* and its eggs. Planorbis was not found in these traps, nor was it present in the Wardan region. Accordingly it is concluded that Bullinus snails reach Egypt from the south, where they can easily be found along the banks during low Nile (April to June) and that with the advent of the flood they are carried into and restock the tertiary canals and drains.

ii. These " recent researches . . . condemn [Professor LEIPER'S] view as hypothetical and wrong " and " destroy the foundation upon which Prof. LEIPER based his hypothesis of combating the snails."

[By courtesy of Professor LEIPER a duplicated copy of his report mentioned has been consulted. The apposite passages are these :

" The Cairo Waterworks Company owns two separate systems, both pumping water from the eastern bank of the Nile by intakes only a few hundred yards apart. One supply provides Cairo with unfiltered water, and is linked with the sedimentation tanks of the old water works of Abbassia, which now act as balancing tanks to maintain a flow in the pipes when the pumps are not working. The other supplies the sedimentation tanks of Rod-el-Farag which provide the filtered water to Cairo. An examination of the latter sedimentation tanks which had been thoroughly cleared out three or four months previously, after the Nile flood, revealed the presence of a few large living Bullinus snails on the sieves guarding the exit from these tanks to the pumps. This paucity of snails was confirmed by an examination of the bottom of the tank, which the Manager of the Cairo Waterworks kindly emptied at my request. A similar examination of the tanks providing the unfiltered supply gave a very different result. Vast numbers of relatively small Bullinus snails were found all over the muddy bottoms, and empty Bullinus shells of all sizes were found in deposits of over one foot in thickness. The only explanation for this extraordinary contrast would appear to be that the snails in very small numbers enter the system from the Nile, and the conditions in the

shallow Abbassia tanks are favourable for breeding, while those in the deep and more frequently cleaned Rod-el-Farag tanks are unfavourable. No molluscs were found during a similar inspection of the sedimentation tanks of the Giza Waterworks on the opposite side of the river."

" The snails occurring in the Cairo Waterworks may have been derived from water entering the Nile a few miles south by the canal escape on the eastern bank, for, on tracing this channel through Maadi, I found, at low water, a considerable number of empty Bullinus shells on its banks. This canal derives from the Nile near Wasta, but in its lower reaches acts as a drain."

" During January, when certain of the main canals carrying water from the Nile to Lower Egypt were empty, an examination of their muddy banks failed to disclose Bilharzia-carrier snails, except in the neighbourhood of the openings of small irrigation canals. Further investigations are required to determine whether there is not an *upward* migration from the smaller into the larger canals at certain times of the year."

Leiper, then, points out that certain facts can be reasonably explained only by concluding that the Nile can and does spread snails. His conclusions fall in with those of Fairley and Bahr in 1920 :

" During the spring months of the year the sluice gates are open and the Nile water is coursing through the canals of Lower Egypt bearing with it large masses of fresh water weed and vegetation and it is to this that most of the infested snails can be found clinging."*

Again : " An annual migration of infected snails from various centres takes place. Such centres are Cairo, Zag-a-zig, Ismailia, etc., and these towns act as foci in the distribution of bilharziasis to Egypt,"†

and these writers suggest that it might be possible to intercept this distribution of infected snails by some device on the lock gates. Leiper also points out in the criticized report that a Bullinus-infected drain does in fact enter the Nile, not merely north of Assuan dam, but shortly above the Cairo waterworks. It is further the case that in the report Leiper advances no hypothesis, and makes no recommendation that any particular prophylactic line should be followed ; but urges that " appropriate experiment and trial must clear up certain doubtful matters before any sound general line of action can be formulated " ; one questionable point being whether it is not possible for snails of the dangerous species to pass upstream from the smaller canals at certain seasons, as indeed other species of snails are known to do.]

C. L.

Onsy (Anis.). **Egyptian Splenomegaly caused by Bilharzial Infection.**—*Jl. Egyptian Med. Assoc.* 1930. Mar. Vol. 13. No. 3. pp. 69–72. With 4 coloured plates (issued as supplement in the April 1930 issue).

Bilharzia ova can be shown in certain enlarged spleens by macerating the tissue in 20 per cent. caustic soda and centrifuging the resulting fluid. Yet in most of the spleens so examined no ova were found, and this, it is held, is due to their phagocytosis by giant cells, a condition accompanied by a considerable eosinophilia. This activity finally transforms the splenic pulp into inactive fibrous tissue with a steadily decreasing eosinophilia. In the absence of schistosome ova from these

* Observations on Bilharziasis amongst the Egyptian Expeditionary Force.—*Parasitology*. Vol. 12, p. 65.

† Observations on Egyptian Bilharziasis. Part I. Commonwealth of Australia, Department of Defence. Melbourne.

later cases this conclusion is of course a matter of inference. [Yet it may be that ova were present in some of these negative spleens, for a 20 per cent. caustic soda solution is a strong solvent of chitinoid, and may have destroyed eggs.]

C. L.

Bonnin (Henri). Les splénomégalies d'Egypte. La splénomégalie bilharzienne. [**Egyptian Splenomegalies.**]—*Rev. Prat. Malad. des Pays Chauds.* 1929. Dec. Vol. 9. No. 12. pp. 557–558, 561–568, 571–578, 581–586. [68 refs.]

A consideration of the literature leads to the conclusion that while many of these splenomegalies are bilharzial in origin, it cannot at present be accepted that all are so.

C. L.

Peter (F. M.). Die Bekämpfung der Bilharzia in Ägypten. [**Anti-Schistosomiasis Measures in Egypt.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 153–163 (237–247). [22 refs.]

After a historical survey and the statement that a campaign may be directed either against snails or against the parasite in man, there are considered 80 cases treated by fouadin, a neo-antimosan in which sodium is substituted for potassium. All but 5 were completely cured to the microscope. The great majority were infected by *S. haematobium*, and the treatment was by 9 or 10 intramuscular injections totalling about 0·4 gm. of antimony. Of the total quantity of the metal 50 per cent. was excreted in the urine and 4 per cent. in the faeces, while some was reported as stored in the alimentary canal, liver, spleen, kidney and heart. By X-ray photographs it could not be detected at the site of injection for more than 5 or 10 minutes.

C. L.

Charlier (M.) & Charlier-Collon (N.). Contribution à l'étude du *Schistosoma haematobium* au Congo. [**Study of** *S. haematobium* **Infestation in Belgian Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1930. Sept. 30. Vol. 10. No. 3. pp. 325–339. [25 refs.]

In 41 children, examined because they had haematuria, the eggs of *S. haematobium* were found in the faeces as well as the urine in 19. No adults suffered in this way. Of these 41 the stools showed infections in the following numbers: *S. haematobium* 19, hookworms 2, strongyloides 16, diphyllobothrium 4, taenia 10, ascaris 6, enterobius 3, entamoebae 4. The spleen was enlarged in 20 and eosinophilia averaged 26 per cent. (18·7 to 45·9). This intestinal habitat gave rise to no intestinal symptoms of any sort. Treatment by tartar emetic, 0·02 gm. per dose to a total of 0·5 gm., cured all but 5. No disagreeable symptoms followed except cough in three. The 5 uncured were given antimosan (Heydon 661) intravenously every other day in increasing doses beginning with 0·03 gm. reaching 0·1 and amounting to 1 gm. in all. This cured all without intercurrent malarial relapses.

C. L.

Gopsill (W. L.). **Some Notes upon Schistosomiasis in the Lower Shire District of Nyasaland.**—*Nyasaland Protectorate Ann. Med. Rep. on Health & San. Condition for Year ending 31st December, 1929.* Appendix II. p. 42.

In the centrifuged urine of 100 adults giving no history of haematuria, admitted to Port Herald hospital, *S. haematobium* eggs were found. The only snail in which forked-tailed cercariae were detected was *Melanoides tuberculata* identified at the British Museum, and 50 to 60 per cent. of 500 specimens taken from the Shire River in February to June and October to December were so infected. In July, August and September no new bilharzia cases, rectal or vesical, came for treatment, nor could *M. tuberculata* be found in the river or its dried up bed even when dug into freely with the incitement of reward. "From these observations it would appear that the mollusc *Melanoides tuberculata* is the only snail host of either *S. mansoni* and/or *S. haematobium* in the Lower Shire District."

C. L.

Carrosse (J.). La bilharziose vésicale dans le sud marocain (*Schistosoma haematobium*). [**Bladder Schistosomiasis in S. Morocco.**]—*Ann. Parasit. Humaine et Comparée.* 1930. Mar. 1. Vol. 8. No. 2. pp. 161–164. [5 refs.]

The author discusses 210 cases of schistosomiasis. The implicated snail is *Bullinus contortus* at Marakesh, and it has shown infection with furcocercariae to the extent of 5 or 6 per cent. *Planorbis metidjensis*, the intermediate host in Portugal, is quite numerous but has not been implicated here. Further local investigations are suggested.

C. L.

Zavattari (Edoardo). Le schistosomiasi in Cirenaica. [**Schistosomiasis in Cyrenaica.**]—*Boll. Soc. Med.-Chirurg. di Pavia.* 1930. Vol. 8. No. 3. 28 pp. With 5 text figs. [29 refs.] [Inst. of Comp. Anat. & Physiol., Univ., Pavia.]

Zavattari reports 14 cases of vesical schistosomiasis acquired, it may be safely concluded, about Derna where *Bullinus contortus* is present, and 1 case of intestinal schistosomiasis which is not believed to have been autochthonous. *Planorbis numidicus* is present in certain parts of Tunis, and the distribution of *B. contortus* seems very local.

C. L.

Advier (M.). Les bilharzioses à Saïgon. [**Schistosomiasis at Saigon.**]—*Rev. Prat. Malad. des Pays Chauds.* 1930. Jan. Vol. 10. No. 1. pp. 18, 21–23.

Examination of men of two military units showed 145 infected with schistosomes, mostly *S. mansoni*, all having acquired infection before reaching Saigon. Most of these men were living out of barracks alongside dirty ponds in which children played and which contained *Planorbis* and *Bullinus* species. Yet examination of 1,255 Annamite tirailleurs and 350 children disclosed no autochthonous infection, so that some undiscovered factor is evidently at work in preventing it. Treatment of 33 persons with subcutaneous injections of emetine, 0·08 to 0·12 gm.

on each of ten consecutive days, has caused disappearance of eggs, but these have invariably reappeared.

C. L.

Carrosse (J.). A propos de l'observation de Dimitracof, Foyers européens de bilharziose vésicale ; Enquête en Provence. [**European Foci of Vesical Schistosomiasis.**]—*Bull. Soc. Path. Exot.* 1930. July 9. Vol. 23. No. 7. pp. 731–736. [12 refs.]

In Provence *Bullinus contortus* and *Planorbis metidjensis* are unknown. *P. corneus, P. carinatus* and *P. complanatus* are abundant. There is no indigenous schistosomiasis, but it should not be concluded that it cannot be established. [Dimitracoff described a case of schistosomiasis in a man who had never been out of Europe (this *Bulletin*, Vol. 22, p. 465)].

C. L.

Brumpt (E.). La ponte des schistosomes. [**Oviposition in Schistosomes.**]—*Ann. Parasit. Humaine et Comparée.* 1930. July 1. Vol. 8. No. 3–4. pp. 263–297. With 13 text figs. & 12 figs. on 6 plates. [41 refs.] [Parasit. Lab., Faculty of Med., Paris.]

After noting the work and conclusions of others, Brumpt describes his own which cover *S. haematobium, S. mansoni* and *S. bovis* fresh or in organs, and *S. spindalis* and *S. japonicum* preserved. He points out how different is the habitat of these worms in experimental animals from that in their normal hosts, a difference which suggests different external stimuli, physical and chemical. That on which he lays stress in directing them to small veins is the contact with the surrounding walls which gives them a sense of security and well being. The female generally remains within the male, and when ovipositing her eggs are laid not in batches but one by one. Thus in 94 female *S. bovis* the uterus was found empty in 3 only ; moreover the same female lays eggs at the same stage of development (the miracidia being formed later as they lie in the tissues), and yet they are found in masses in capillaries with freshly laid and miracidium-containing eggs freely mixed. Brumpt concludes that worms live in the submucosa and that eggs laid there are forced into capillaries partly by the *vis a tergo* of those subsequently posited, partly by a force pump action in which the male hunches himself up, temporarily fills the blood vessel, and produces a reversed blood flow accentuated by the intestinal movements of the host. Egg masses lying in capillaries are manifestly not grasped by their walls, there is plenty of room for blood to circulate round them, so it is suggested that they are kept in position in these vessels by something adhesive, perhaps inflammatory. Certainly the spine is held to have no action in this direction, and it is pointed out that *S. japonicum* has none to function in this manner. Nor is the spine held to function in piercing and allowing escape from the vessels, since the egg of *S. bovis* may leave them sharp end first or blunt end first. Escape may be due to vascular rupture or to the leucocytes which surround the eggs and cling to their shells, perforate the capillary wall and destroy its canalization. They may then perhaps reach the surface and escape, or be destroyed in pseudotubercles leaving no trace except for débris of their shells.

C. L.

Sorour (M. F.). **Bilharziosis of the Blood-Vessels.**—*Proc. Roy. Soc. Med.* 1930. July. Vol. 23. No. 9. pp. 1369–1370 (Sect. Trop. Dis. & Parasit. pp. 25–26).

The paper deals with the lesions produced in the non-capillary blood vessels themselves as the result of schistosome infection. The portal vein has been found in no respect altered in structure. Visceral veins often show organized thrombosis with canalization near parts inhabited by worms. Round a dead worm endothelial proliferation occurs. An ovum is described as exciting endothelial proliferation round it and subendothelial proliferation where the spine enters the vascular coat, the latter lesion being described as exactly similar to that of syphilis and producing atheroma and calcification ; [no mention of the exclusion of concurrent syphilis is made]. In the muscular coat an egg produces a "bilharzioma" of endothelial cells, later forming a concentrically fibrosed swelling likened to a healed saccular aneurism. Toxins are held to be the cause of endotheliomatous bladder growths.

C. L.

Sorour (M. F.). **The Significance of the Polymorphonuclear Eosinophile Cell and the Association of Bilharziosis and Tuberculosis.**—*Jl. Egyptian Med. Assoc.* 1930. Mar. Vol. 13. No. 3. pp. 73–79. With 6 figs. on 3 plates. [Path. Dept., Egyptian Univ., Cairo.]

Sorour's thesis is that tuberculosis and schistosomiasis are each common causes of death, but that the association of the two diseases in one person is, comparatively speaking, exceedingly rare. The same holds for association of tubercle with another disease also producing high eosinophilia, namely ankylostomiasis. Two cases are cited in which cure of schistosomiasis was followed by active tuberculosis. When tuberculous and bilharzial lesions lie contiguously the tubercular lesions are encapsuled in dense fibrous tissue. It is suggested that high eosinophilia induced by these helminthic infections is antagonistic to the tubercle bacillus and the matter is being investigated.

C. L.

Tsykalas & Riegl (R.). Diagnostik latenter Bilharzioseaffektionen durch Reaktivierung. [**Diagnosis of Latent Schistosomiasis by Reactivation.**] —*Ztschr. f. Urol. Chirurg.* 1929. July 9. Vol. 27. No. 4–6. pp. 433–437. [17 refs.]

The method advised for making evident a latent schistosome infection is to inject 0·05 gm. to 0·1 gm. of emetine [$\frac{3}{4}$ to $1\frac{1}{2}$ grains], and 4 to 6 hours later to look for and expect to find an appearance of blood and eggs in the urine in cases where none were detected before. The authors find themselves in disagreement with Khalil's statement that emetine is a haemostatic in schistosomiasis.

C. L.

Christopherson (J. B.). **Bilharzia Disease in Children.**—*Proc. Roy. Soc. Med.* 1930. Oct. Vol. 23. No. 12. pp. 1733–1743 (Sect. Trop. Dis. & Parasit. pp. 43–53). With 4 text figs. [10 refs.]

Christopherson showed a series of photographs illustrative of the point that schistosomiasis is essentially a children's disease, the disastrous

and terrible complications so common in adult Egyptians being the result of constant infections added from childhood onwards; for the parasites are clearly long lived, living ova having been passed for at least 28 years after all possibility of reinfection has ceased. So that although three-quarters of a million persons are treated annually in Egypt, the most potent source of infection, the child, is generally neglected, and no obvious impression has been made on the disease. Two cases of failure of treatment in European children are recorded, failure because it had to be stopped owing to the appearance of allergic symptoms possibly due to the largely protein diet of the race. Moreover in adults there may be on the night of the injection excruciating muscular pains and a temporary paralysis, partial or complete. These symptoms are reminiscent of the shock-like collapse caused by histamine in experimental animals and are perhaps due to a toxic histamine-like body in the liver. Although antimony, it is taught, is contra-indicated in cardiac and renal disease, hepatic disease is not mentioned in this connexion. Yet antimony belongs to the phosphorus-arsenic chemical group and these are hepatic toxins; in rabbits killed with antimony tartrate the main damage found is in the liver cells; jaundice and bilious vomiting occur in a proportion of cases. The drug is contra-indicated when cirrhosis of liver with ascites occurs in *S. mansoni* infection, nor do like cases in *S. japonicum* infection do well. So it is asked " Does the antimony produce a hepatic toxin lethal to parasites which in larger quantities is toxic to the human organism? " And it is added " The dose required to kill the parasite in children comes very near to the largest dose tolerated by the liver cell."

In discussion N. Hamilton Fairley referred to a patient who after about 9 " grams of antimony " became gravely ill with collapse and diarrhoea, and two days later severe jaundice appeared with bile salts and pigments in the urine. " Undoubtedly the pathology of this condition was a toxic necrosis of the liver due to antimony administration."

[" gms." and " grs.," and again " grams " and " grains, " are readily confused by the printer and, as this instance shows, overlooked by the type reader. The symbol " g." can be mistaken for or confused with no other abbreviation and in the abstractor's view is the only admissible abbreviation of " gramme."]

C. L.

Müller (H. R.) & Stender (A.). Bilharziose des Rückenmarkes unter dem Bilde einer Myelitis dorsolumbalis transversa completa. [**Schistosomiasis of the Spinal Cord simulating Myelitis.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Oct. Vol. 34. No. 10. pp. 527–538. With 8 text figs. [12 refs.] [Nerve Clinic, Univ., Hamburg-Eppendorf.]

In this remarkable case a man who had had urinary disease in Brazil diagnosed without microscopic examination as gonorrhoea developed six months later and in a single night a hemiplegia from which he died with a stinking urine and which was referred to a lesion about the second and thirp dorsal vertebrae. Lesions of a pyelocystitis appeared at autopsy but there seemed no reason to keep any organs except brain and cord. Microscopic examination showed plentiful pseudotubercles in the cord centred on eggs of *Schistosoma mansoni*, a fact established when the evidently puzzled authors consulted Fülleborn. Although Tsunoda and Schimamura found eggs of *S. japonicum* in the brain in 1906, and Ferguson those of *S. haematobium* in brain and cord in 1913, this is believed to be the first

instance in which *S. mansoni* has been so involved ; and in view of the value of treatment the need for exclusion of these infections in nervous disorders occurring in endemic countries is pointed out.

C. L.

GORDON (R. M.) & HICKS (E. P.). **'Fouadin' and 'Auremetine' in the Treatment of *S. haematobium* Infections amongst West African Children ; together with Observations on the After-Results of Treatment with Emetine Periodide and Emetine Hydrochloride.**—*Ann. Trop. Med. & Parasit.* 1930. Oct. 22. Vol. 24. No. 3. pp. 443–447. [1 ref.] [Sir Alfred Lewis Jones Research Lab., Freetown, Sierra Leone.]

Six severely infected children were treated with fouadin in the prescribed dosage. Live ova disappeared from the urine in 8 to 22 days. The table records examinations up to 26 days after beginning treatment. Five of them lost 1 to 3 lbs. in weight. "In one instance (Case No. 1) persistent vomiting, lasting four days, occurred, and it was not considered advisable to continue the course." The table shows the course in this case, a boy of ten, as lasting to the eighteenth day and comprising 29 cc. of the drug ; and in that of another boy, also of 10, as lasting the same time with administration of 28 cc. Considerable local pain accompanied the bulky intramuscular injections. Auremetine was given by mouth to one case. Live ova were not found on the last day of treatment nor two days later. Of fourteen patients who had been treated four years earlier with emetine (this *Bulletin*, Vol. 24, p. 178), nine were now found infected on re-examination, namely 5 of 8 treated with the hydrochloride, and 4 of 7 with the periodide.

C. L.

STAUDT. Note au sujet du traitement de la schistosomiase. [**Treatment of Schistosomiasis.**]—*Bull. Méd. du Katanga.* 1930. Vol. 7. No. 2. pp. 35–41.

Staudt's findings are these : Stibenyl and neostibosan were inactive. Stibyal cured 2 of 3. Antimosan well tolerated, active, requiring further study. Tartar emetic, no result except vomiting with tablets a year old given by mouth ; some improvement with fresh tablets. Intravenous tartar emetic, cured all of 9 young persons ; emetine injections, 7 cures in 9 ; alternation of the last two drugs, 5 cures in 5 cases.

C. L.

i. CAWSTON (F. G.). **A Consideration of Some Cases of Bilharzia Disease treated with Preparations of Antimony other than Tartar Emetic.**—*Jl. Trop. Med. & Hyg.* 1930. Nov. 1. Vol. 33. No. 21. pp. 317–318. [5 refs.]

ii. ORENSTEIN (A. J.). [**Treatment of Schistosomiasis.**] [Correspondence.]—*Ibid.* 1931. Jan. 15. Vol. 34. No. 2. p. 32.

i. "Fouadin was widely advertised. . . . It was claimed that the drug was free from . . . undesirable toxic effects. . . . The claim was even published that three injections might effect a cure. Indications of severe hepatitis following the use of fouadin, even where there was no question as to the stability of the supply, were allowed to pass unheeded. . . . Due consideration of the pathological condition of the bilharzia patient forces one to the conclusion that the use of fouadin in these patients frequently

results in severe hepatitis, a complication which is greatly to be feared in persons whose liver function is already impaired through the presence of schistosome invasion."

On veterinary experience of antimosan intramuscularly for nagana, it is held to promise well in schistosomiasis.

ii. Orenstein, as one who drew the attention of South African practitioners to fouadin and as a member of the Transvaal Bilharzia Committee, asks Cawston to substantiate his statement that the drug frequently causes severe hepatitis, to give a detailed description of the pathological condition of these patients, and to state his reasons for concluding that fouadin is more deleterious than tartar emetic. Veterinary experience with antimosan Orenstein holds to favour its use. He has experience of some 200 cases of intravenous and intramuscular injection with fouadin, and apparent cure in each case.

C. L.

Brumpt (E.). Localisation vésicale expérimentale d'oeufs de *Schistosoma mansoni* chez une souris. Localisations vésicales à *S. mansoni* et rectales à *S. haematobium* chez l'homme. [**Localization of Ova of** *S. mansoni* **and** *S. haematobium.*]—*Ann. Parasit. Humaine et Comparée.* 1930. July 1. Vol. 8. No. 3/4. pp. 298–308. With 2 text figs. [42 refs.] [Parasit. Lab., Faculty of Med., Paris.]

Brumpt collects the literature noting the cases, since 1884, where eggs of *S. mansoni* have been found in the urine and, since 1914, where those of *S. haematobium* have been found in the faeces. He reports too that among 10 mice infected with *S. haematobium*, 72 with *S. mansoni*, and 58 with *S. bovis*, eggs were found in the bladder once only—in an infection with *S. mansoni*—and in that instance miracidia were not present in these eggs although they were in others contained in the intestine of the same mouse.

C. L.

Cawston (F. G.). **Schistosome resembling** *S. japonicum* **in South Africa.**—*Jl. Trop. Med. & Hyg.* 1930. Oct. 1. Vol. 33. No. 19. p. 292. [1 ref.]

Norman Walker has seen in faeces in Durban an ovum resembling that of *S. japonicum* and Annie Porter has found in *Limnaea natalensis* a cercaria identical with *S. japonicum*.

C. L.

Sorour (M. F.). Peritoneale und subperitoneale Bilharziasis. [**Peritoneal and Subperitoneal Schistosomiasis.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Nov. Vol. 34. No. 11. pp. 577–581. With 5 text figs.

Sorour lays stress on the well known lesions which occur in and under the peritoneum, pseudotubercles surrounding eggs, which may have the structure of a typical endothelioma.

C. L.

Abbatucci (S.). La prophylaxie de la bilharziose. [**The Prevention of Schistosomiasis.**]—*Rev. Prat. Malad. des Pays Chauds.* 1930. Jan. Vol. 10. No. 1. pp. 24, 27–30. [4 refs.]

A useful summary of existing knowledge regarding treatment and the destruction of snails.

C. L.

Leger (Marcel). La bilharziose intestinale. Schistosomiasiques et schistosomés dans les colonies françaises. [**Rectal Schistosomiasis in the French Colonies.**]—*Rev. Prat. Malad. des Pays Chauds.* 1930. May. Vol. 10. No. 5. pp. 201–206, 209–216, 219–222, 225–230, 233–239. [3 pages of refs.]

After a wide survey of the literature the author stresses the importance of establishing for each French colony the snails which are the local intermediate hosts of *S. mansoni*. Further there must be special conditions which make an infected person a carrier or a sick man. Why also does *S. mansoni* never result in the urinary passage of eggs in the Antilles and Madagascar where it is the only blood fluke, but does so in the French West African colonies? Why does *S. haematobium* produce in certain countries intestinal bilharziasis almost exclusively? Is there only one species with a particular taxis dependent on the mollusc through which it has passed?

C. L.

Maass (E.) & Vogel (H.). Beobachtungen ueber Schistosomiasis mansoni in Französisch-Guinea und Liberia. [**Schistosomiasis Mansoni in French Guinea and Liberia.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Oct. Vol. 34. No. 10. pp. 564–566.

Maass is of the Mission Hospital, Bolahun, Liberia. Eggs of *S. mansoni* have been found in 3 persons coming from a spot in Liberia 100 km. east of the station, and in those coming from 32 villages in French Guinea. One of these villages, Tomassadou-Digbo, was investigated. As most do, it lies on a hill with a stream running round its base in which *Planorbis choanomphalus* was found, identified by Degner of the Hamburg Zoological Museum. Half these snails contained a furcocercous cercaria, which penetrated human skin. Examination without attempted concentration showed that, of 25 stools lying about, 15 contained eggs of *S. mansoni*. The water of the stream is used for washing, drinking and irrigating rice, and close to its edge on the rice farm faeces are deposited which must readily be washed into the water with rain.

C. L.

Schwetz (J.) & Baumann (H.). Note sur la bilharziose intestinale de la région de Stanleyville. [**Intestinal Schistosomiasis in the Stanleyville District.**]—*Rev. Méd. et Hyg. Trop.* 1930. May-June. Vol. 22. No. 3. pp. 138–141. [7 refs.] [Parasit. Lab., Stanleyville.]

Reverting to their previous report [see above p. 173], on stool examination of 955 [?952] children they found ova of *S. mansoni* 12 times (9 boys, 3 girls) and *S. haematobium* 33 times (19 boys, 14 girls). In 361 soldiers, stool examinations showed eggs of *S. mansoni* 12 times and *S. haematobium* 4 times, one of the 15 cases having both eggs. They note that the findings confirm Chesterman's, that in this region *S. haematobium* is more often the cause of intestinal schistosome infection than is *S. mansoni*.

C. L.

GIRGES (Rameses). **The Prognosis of Schistosomiasis Mansoni.**—*Jl. Trop. Med. & Hyg.* 1930. Mar. 1. Vol. 33. No. 5. pp. 65–68.

In prognosis most depends on early treatment. If early the organs may completely recover; if late, recovery is only partial. Return to work is the rule, but reinfection after cure is generally attended by very severe symptoms and should be avoided by removal from the endemic area if this is in any way possible. Cases with enlarged liver may live indefinitely; if there is ascites life usually ends within two years; if the heart is dilated death may occur suddenly at any time. The parasites are held to live 10, or even 25 years.

C. L.

GIRGES (Rameses). **The Treatment of Schistosomiasis Mansoni, both Medical and Surgical.**—*Jl. Trop. Med. & Hyg.* 1930. Feb. 15. Vol. 33. No. 4. pp. 49–55. With 5 charts & 3 figs. [12 refs.]

The limits of medical treatment have been noted [this *Bulletin*, Vol. 27, p. 462]. Rectal papillomata may be dealt with in mild cases by removal after dilatation of the sphincter. In prolapse cases there are mentioned zinc chloride, the cautery, excision of strips of mucosa, or resection. In the hepatic type good results are claimed from splenectomy.

C. L.

GAMBIER. Bilharziose intestinale observée chez un soldat antillais n'étant pas retourné dans son pays d'origine depuis plusieurs années. [**Schistosomiasis Mansoni in a West Indian Soldier in Indo-China.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1930. May. Vol. 8. No. 5. pp. 437–438.

Eggs of *S. mansoni* were found in Indochina in 1929 in a man who had left the Antilles in 1916. The other localities mentioned as those in which he had since lived were Salonica and Indochina. He had had no intestinal illness till his present one, which suggested amoebic dysentery.

C. L.

i. LE ROUX (P. L.). **Notes on the Life-Cycle of *Schistosoma mattheei* and Observations on the Control and Eradication of Schistosomiasis in Man and Animals.**—*15th Ann. Rep. Director of Vet. Services, Union of South Africa.* 1929. Oct. Vol. 1. (Sections I to IV.) pp. 407–438. With 5 plates. [9 pages of refs.]

ii. SUAREZ (Ramon M.). **Schistosomiasis of the Lungs simulating Bronchial Asthma.**—*Bol. Asoc. Med. de Puerto Rico.* 1930. Mar. & Apr. Vol. 21. No. 176. pp. 40–46.

i. In an immediately preceding paper in this Report VEGLIA and LE ROUX had described a sheep schistosome with terminal spined eggs and named it *S. mattheei*. In this paper Le Roux considers the distribution in the sheep's body, the migration of the adults and eggs in its vessels and tissues, the pathological lesions caused by animal schistosomes and by *S. mattheei* in particular in the small intestine, liver, pancreas, spleen, lungs and lymph glands, in all of which organs adults have been found. In the lungs there is constant and conspicuous pigmentation and a fairly constant presence of pseudotubercles. "The comparative absence (according to the literature) of lung lesions in man must be attributed to the lack of looking for them."

ii. Suarez described a boy of 16 with very troublesome cough, and râles and rhonchi in his chest, with no expectoration, with an eosinophilia of 74 per cent., with a few ova of *S. mansoni* in the stools, and with a positive reaction to intradermal injection of saline but not of alcoholic extract of the liver of infected snails. The literature is reviewed and the comment made : " So we have seen that most authors do mention lung pathology and speak of the frequency of bronchitis associated with or preceding the intestinal or dysenteriform symptoms of schistosomiasis.

[Fairley and Mackie (below) point out that G. A. Turner (*Jl. Trop. Med. & Hyg.*, 1909, Vol. 12, p. 35) found in South Africa that 64 per cent. of 28 cases dying of pulmonary complaints showed in their lungs ova of *S. haematobium*, while in 11 dying of other complaints the percentage was 33.]*

C. L.

Fairley (N. Hamilton), Mackie (F. P.) & Jasudasan (F.). **Studies in** *Schistosoma spindale.*—*Indian Med. Res. Memoirs. Supplementary Series to Indian Jl. Med. Res.* 1930. Sept. Memoir No. 17. 180 pp. With 18 graphs, 2 colour plates & 82 figs. on 17 plates. [90 refs.] [Haffkine Inst., Bombay.]

i. **The Infective Rate, Seasonal Incidence and Source of Supply of Infected Molluscs.** [Fairley & Jasudasan.] pp. 1–10. With 2 graphs in text & 4 figs. on 2 plates. [14 refs.]

Since cercariae of any mammalian schistosome act with antibody called forth by any adult mammalian schistosome, alcohol-soluble extracts for diagnostic use in complement fixation tests can be made from the fresh livers of snails parasitized by cercariae of any such species. But an alcoholic extract of any tissue may in sufficient concentration act as a Wassermann antigen. Accordingly it is necessary to have as much cercaria and as little liver as possible—to have heavily infected livers, which are recognized by being enlarged, friable and yellowish. In Salsette, Bombay, *Planorbis exustus* has been found in maximum infection of 9·9 per cent. with *S. spindale* ; in El Marg, Egypt, *P. boissyi* in 54 per cent. with *S. mansoni*. Egypt then offers great facilities for the making of diagnostic bilharzia antigen from naturally infected snails.

ii. **The Definitive Hosts of** *S. spindale* **with Special Reference to Alimentary Infection in Ruminants.** [Fairley & Jasudasan.] pp. 11–15. [7 refs.]

Goats, cattle and water buffaloes are naturally infected with *S. spindale*. Goats may be artificially infected through the mouth where

* Professor Leiper has kindly furnished the following additional references :

Belleli (V.). Les oeufs de Bilharzia haematobia dans les poumons.—*Unione med. egiz.* Alessandria. 1884–5. Vol. 1. No. 22–23. pp. 1–3.

Bowlby (A. A.). Specimens of the *Distoma haematobium* (*Bilharzia haematobia*) with the Urinary Organs and Lung containing Ova.—*Trans. Path. Soc. London.* 1890–1891. Vol. 42. pp. 194–195.

Symmers (W. St. Clair). A Note on a Case of Bilharzial Worms in the Pulmonary Blood in a Case of Bilharzial Colitis.—*Lancet.* 1905. Jan. 7. p. 22.

see Shiess-Bey in Birch-Hirschfeld (F. V.). Lehrbuch der pathologischen Anatomie. 4. Aufl. Vol. 1. Allgemeine pathologische Anatomie. p. 303. Abbildungen von Eiern in Lungengewebe.

penetration of cercariae into the tongue is pictured; and after conveyance of cercariae by tube into the alkaline stomach, probably the rumen, infection may be heavy. Oral infection in achlorhydial conditions in man has not hitherto been adequately considered as a definite risk.

iii. **The Experimental Pathology in the Goat with Special Reference to Verminous Phlebitis.** [Fairley & Mackie.] pp. 17–39. With 63 figs. (3 coloured) on 13 plates. [24 refs.]

Skin invasion occurs freely in goats and decaudication is complete within 20 minutes. Entry may be direct through the intact skin, or by hair follicles or sebaceous glands. Since about 150,000 was the usual number of cercariae applied to the skin and 396,000 the maximum, and since complete invasion was verified, many cercariae must rapidly perish. There is considerable local skin reaction and it is believed that destruction of cercariae begins at once locally. Somewhat later there is widespread vascular infection. Thus in 30 goats killed within six months of infection the distribution of worms in veins was as follows: mesenteric 30, portal 28, gastric 12, pancreatic 11, splenic 9, pelvic 3, inferior vena cava 3, iliac, azygos and renal each 1; also right heart 4, pulmonary artery 8. Later infection becomes limited to the normal habitat—the portal and mesenteric veins—so that a biological equilibrium is established, and the destruction which has been going on to effect it apparently ceases, at least no spontaneous cure occurred in this investigation. In these heavy infections males were twice as numerous as females, yet the cercariae were invariably derived from a large number of molluscs. Lesions found before ova were produced were: extensive clotting, the clot containing dead and disintegrating flukes, with toxic spoiling of liver and kidneys, and necrosis of their cells, often over extensive areas and associated with haemorrhage; and deposit of golden brown pigment in Kupfer's cells, having origin evidently in the pigment from digested haemoglobin found in the caeca of the flukes. There is small-celled periportal infiltration and macroscopic appearance of pseudotubercles. After eggs appear the aggregation in the liver produces round them more pseudotubercles with consequent focal fibrosis, showing as a periportal cirrhosis which in its advanced stages resembles the pipestem cirrhosis described by Symmers (1903) in Egyptian schistosomiasis.

iv. **Further Observations on Spontaneous Cure in** *Macacus sinicus.* [Fairley, Mackie & Jasudasan.] pp. 53–59. [8 refs.]

The monkey *Macacus sinicus* displays a degree of natural immunity to infection shown by failure of schistosomules to develop beyond a certain stage, the θ stage, after reaching which they die; yet this natural immunity becomes enhanced by previous infection. This is clear because for three months after a primary infection, another infection is followed by almost no development in the veins. Yet it was not possible after spontaneous recovery to find any added anti-cercarial power in the serum.

v. **The Guineapig as a Host for Male Schistosomes.** [FAIRLEY, MACKIE & JASUDASAN.] pp. 61–68. With 18 figs. on 4 plates. [13 refs.]

In guineapigs infected each with 40,000 to 72,000 cercariae only male worms were found in numbers from 11 to 720 individuals a guinea-pig. They produced phlebitis and thrombosis with periportal cellular infiltration and fibrosis, and degeneration of the liver cells. Clearly further clinical, serological and pathological investigations are needed to establish the pathological effects on man of male schistosomes. The cercariae entered through the hair follicles.

vi. **The Complement Fixation Reaction with Cercarial Antigen—a Study in Experimental Serology.** [FAIRLEY & JASUDASAN.] pp. 73–143. With 18 graphs. [24 refs.]

This section comprises half the report. The protocols are exhaustive and will be studied in detail now and in the future by those engaged in this line of investigation.

A large number of experimentally infected goats were used in this enquiry, and numerous complement fixation tests were made on each animal. A special feature of the investigation was the introduction of graphs showing quantitatively the antibody content of the serum from the initial exposure to cercariae until death. Marked increase in antibody was generally demonstrated during the second week of the disease.

Adult worms have not formed reliable antigens. The cercariae are used (as in i). The method of preparation is described. Its group nature is proved for the three human schistosomes and for *S. bovis*, *S. indicum* and *S. spindale*.

The techniques are given, both warm and cold, and the persistent character of the reaction is noted, though whether this persists after destruction of all flukes by treatment there has not been time to settle. Yet the results of the slow removal of dead schistosomes may well keep up a reaction after all are dead. On the other hand the appearance of negative serological reactions during treatment does not necessarily mean disinfestation. The cerebrospinal fluid has invariably been negative, and the cord and brain free from infection. After treatment with tartar emetic the male to female ratio was 6·2 to 1, and with emetine 4·3 to 1 ; 100 to 5, 55 to 3 and 25 to 0 and 50 to 0 being included. It is shown then that treatment tends to kill females and spare males.

C. L.

FAUST (Ernest Carroll). **Larval Flukes associated with the Cercariae of *Clonorchis sinensis* in Bithynoid Snails in China and Adjacent Territory.**—*Parasitology*. 1930. Mar. Vol. 22. No. 2. pp. 145–155. With 5 plates. [4 refs.] [Dept. of Trop. Med., Tulane Univ. of Louisiana, New Orleans.]

Faust adds the descriptions of 10 new species of cercariae from bithynoid snails (he has already described six) and one from *Planorbis möllendorfi*. One of these, *Cercaria beatifica*, a heterophyid larva, needs to be differentiated from the cercaria of *Clonorchis sinensis* which develops in the same mollusc, *Bithynia fuchsiana*. All these forms are much commoner in bithynoid snails than is the larva of Clonorchis.

C. L.

Du (S. D.). **Preliminary Report on a Fluke found in Shrimps in Chengtu and its Environs.**—*China Med. Jl.* 1930. July. Vol. 44. No. 7. pp. 679–683. With 1 plate.

People of Szechwan Province " are fond of eating live shrimps previously soaked for a few minutes in Chinese wine and condiments (drunken shrimps). The poor creatures bathed in wine and condiment frequently jump out of the containing dish, and the diners often display their dexterity catching the shrimps with their chopsticks." Such shrimps collected from rivers and streams have their stomachs infected with an adult fluke (which is about 5 mm. long and is described) to the extent of 425 out of 769 dissected. It is in effect pointed out that in this strange and seemingly one-sided sport the shrimp will yet get its own back should it carry as an intermediate host a parasite capable of living in man.

C. L.

Tubangui (Marcos A.) & Francisco (Sixto A.). **The Presence in Human Stools of the Eggs of a Trematode Parasitic in Fish.**—*Jl. Philippine Islands Med. Assoc.* 1930. Jan. Vol. 10. No. 1. pp. 31–33. With 1 text fig. [3 refs.]

Two more cases are recorded in which trematode eggs found in the faeces were shown almost certainly to have come from food. In this case they are referred to *Metadena ovata* from the intestine of the fish *Pristipoma hasta*.

C. L.

Eales (N. B.). **A Method of obtaining Stages in the Life-History of the Liver Fluke for Class Purposes.** [Correspondence.]—*Nature.* 1930. May 24. Vol. 125. No. 3160. p. 779.

Adult flukes, alive or dead, from a slaughter house are washed free of bile and mucus and dissected under a binocular. Yellow eggs are washed out and kept in a flat-bottomed watch glass. Daily development can be watched. As soon as possible after ha ching of miracidia a *Limnaeus truncatulus* is introduced and the process of infection can be watched. Snails can be killed and sectioned at intervals to show sporocyst and redia stages. Eales had no deaths of snails from infection, however heavy, during the period under report, March 11th to May 3rd.

C. L.

Thomas (Lyell J.). **Notes on the Hatching of** *Diphyllobothrium latum* **Eggs.**—*Jl. Parasitology.* 1930. June. Vol. 16. No. 4. pp. 244–245. With 1 text fig. [3 refs.]

Eggs of *D. latum* kept in 2-inch Stender glasses out of direct sunlight mostly hatched within 12 days. In a few individuals development was much slower ; hatching was observed as late as the seventy-fourth day, and the hexacanth embryo was smaller and measured 18 μ to 20 μ instead of the normal of 24 μ to 26 μ. Presumably copepods are capable of becoming infected over a considerable period after deposit of the faeces, and the variable size of the procercoids within them is perhaps thus explicable.

C. L.

Vogel (Hans). Studien ueber die Entwicklung von Diphyllobothrium. II. Teil: Die Entwicklung des Procercoids von *Diphyllobothrium latum.* [**Development of Procercoids of** *D. latum.*]—*Ztschr. f. Parasitenk.* 1930. Aug. 9. Vol. 2. No. 5. pp. 629–644. With 8 text figs. [10 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Examination of living larvae and those stained with methylene-green-pyronin shows that the coracidium contains separate retractor and protractor muscles for the 6 hooks, two excretory cells, and two other sets of cells, namely large plastine cells which are essentially concerned in building the body and small-body cells whose use was not determined. As intermediate hosts *Cyclops viridis*, *C. albidus*, *C. bicuspidatus* and *C. serrulatus* could not be infected, they digested the coracidium; one strain of *C. strenuus* could not be infected, others could. *Diaptomus gracilis* and *D. vulgaris*, the latter a new intermediate host, were more readily infected than *C. strenuus*. The procercoid develops under the cast-off cuticle of the coracidium. Apart from cuticle, muscle, and calcareous bodies there are formed a number of frontal glands opening by ducts at the anterior end, and a complicated excretory system with the excretory pore at the posterior end, at the base of the appendage containing the hooks, but with accessory pores anteriorly. The whole development resembles that of Holostomidae.

C. L.

Vogel (Hans). Studien zur Entwicklung von Diphyllobothrium. I. Teil: Die Wimperlarve von *Diphyllobothrium latum.* [**Development of Diphyllobothrium.**]—*Ztschr. f. Parasitenk.* 1929. Oct. 12. Vol. 2. No. 2. pp. 213–222. With 6 text figs. [6 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

In the dark the egg of *D. latum* develops normally but the embryo does not escape. If then brought into the light it becomes active and escapes past the raised operculum. In deep water those eggs hatch first which are brought to the surface, an observation which Vogel correlates with the lessened pressure there and so looks on as mechanical. Movement of the ciliated larva is directly forward with alternate rotation to left and right; the cilia at the anterior end are longer than elsewhere, all have an axial thread and a contractile covering, but beyond the latter the ends of the cilia at the anterior end project naked. Staining with azur eosin and methylene green pyronin shows that there exist cells with the shape and staining properties of the germ cells of miracidia, as well as body cells.

C. L.

O'Farrell (W. R.). [*Diphyllobothrium latum* **Infestation in Ireland.**]—*Irish Jl. Med. Sci.* 1930. Sept. Ser. 6. No. 57. p. 542.

A farmer of 50, a native of Leitrim, who often ate pike, passed tapeworm segments when under treatment for diabetes. Haemoglobin 75, red corpuscles 3,390,000, eosinophils 1 per cent. Male fern brought away a ball containing 4 heads and strobila.

C. L.

Grant (F.). 106 Bothriocephalusketten bei einem Kranken. [**Patient with 106 Diphyllobothria.**]—*Klin. Woch.* 1930. Mar. 15. Vol. 9. No. 11. p. 502. [4 refs.]

A man of 66 had been well till the autumn of the previous year. When seen in June 1929 he was slightly icteric, short of breath and too weak to

work. Haemoglobin was 25 per cent., red corpuscles 1,400,000, no eosinophilia but polymorphs having as many as 7 segments ; much poikilocytosis, anisocytosis, polychromasia and many normoblasts ; and many diphyllobothrium eggs in the stools. " Filmaron " produced a knot of diphyllobothrium strobila, weighing 400 gm. after being hardened in formalin and containing 106 heads. The blood then improved greatly and no further eggs were found in the stools.

C. L.

Talysin (Th.). *Dibothriocephalus minor* Chol. der kleine Bandwurm Transbaikaliens. [*D. minor*, **the Transbaikalian Tape Worm.**]—*Ztschr. f. Parasitenk.* 1930. May 13. Vol. 2. No. 4. pp. 535–550. With 17 text figs. (2 coloured). [5 refs.] [Biol. Lab., State Univ., Irkutsk.]

Ten examples were recovered from 2 men, with these characters. The length lies between 10 and 26·5 cm. with about 200 proglottids. The head in dorso-ventral view is conical with rounded point, and with the suckers running on to the body so that there is no neck. In the last proglottids the length is 2/9 of the breadth. The edges of the strobilus have a serrated effect. The ovaries are compressed antero-posteriorly (cephalo-caudally) so that the long axis lie across the proglottis. The vagina passes forward in curves. The uterine coils lie mainly from side to side and some lie in front of the uterine opening which is situated about the middle of the proglottis. The vas deferens coils posteriorly to the ootype before coursing anteriorly. The eggs often have a terminal tubercle and the relation of length to breadth is a 3 to 2. The figures make the structure abundantly clear.

C. L.

Nagoya (Takeguma). **Route of Migration of the orally fed** *Ligula mansoni* **Cobbold in Frog and Mouse.**—*Japan. Jl. Experim. Med.* 1930. Feb. 20. Vol. 8. No. 1. pp. 39–54. [14 refs.]

Considerable numbers of plerocercoids were fed to frogs and mice. The degree of migration from the alimentary canal depended on the temperature of the host. In the mouse, the peritoneal cavity might be reached in an hour ; in the frog in September in 2 hours, while in February no attempt was made to leave the alimentary canal within 11 hours. From the peritoneal cavity the worms in the frog reached connective tissue behind the thyroid, and heart, and penetrated the muscles and even attempted the passage of the nutrient foramen of the femur. They produced much tearing and haemorrhage and eventually settled mostly in the muscles at the back of the thigh. In the mouse dispersion and damage were as great, but it is noteworthy that those which entered lymph glands are the only ones referred to as necrotic, while those entering the liver were enclosed in connective tissue. In the mouse the subcutaneous tissue is the popular final habitat.

C. L.

Storti (Edoardo). Anemia sperimentale da botriocefalo. (Nota preventiva.) [**Experimental Diphyllobothrium Anaemia.**]—Reprinted from *Bol. Soc. Med.-Chirurg. di Pavia.* 1930. Vol. 8. No. 3. 8 pp. [Inst. of Comp. Anat. & Physiol., Univ., Pavia.]

The author infected three dogs with spargana of *D. ranarum*. In ten days the worms matured and ova were found in the faeces, but

for a month no recognizable symptoms were produced. After this one dog went rapidly downhill, became very anaemic and emaciated and died in three months. The red cells were reduced to about a million, and 27 per cent. of them were nucleated. The anaemia was of a lytic type with considerable attempts at regeneration on the part of the bone marrow. In the second dog the course was much longer and the anaemia developed much more gradually though the final picture, after 7 months, was closely similar. The third showed only a slight fall in the red cells and remained in that state for the 8 months of observation. The bone marrow in the first showed marked hyperplasia; spleen sections presented a myeloid metaplasia with erythroblasts, myelocytes and megakaryocytes scattered irregularly in the sinuses and spleen pulp.

H. H. S.

Kobayashi (Hidekazu). **Studies on the Development of** *Diphyllobothrium mansoni* **Cobbold, 1882 (Joyeux 1928). (I. Report.) Embryonal Development in the Egg of** *Diphyllobothrium mansoni*.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1930. Sept. No. 306. [In Japanese. With 23 figs. on 1 plate. English summary pp. 44–49.] [Govt. Med. College of Formosa, Taihoku, Japan.]

The egg of *D. mansoni* develops easily in water to an onchosphere in 12 to 14 days at 28° C. The growth from day to day was studied, is described, and is well pictured.

C. L.

Lutz (Hermann). Ein Fall von *Dibothriocephalus mansoni* s. *Sparganum mansoni*. [**Case of Ocular Sparganosis.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. July. Vol. 34. No. 7. pp. 398–399. [1 ref.] [Tet-Tsi Hosp., Kaying, Canton, China.]

Another case in which ocular sparganosis followed the application to the eye of frog's muscle, in this case minced [this *Bulletin*, Vol. 27, p. 964].

C. L.

Joyeux (Ch.) & Foley (H.). Recherches épidémiologiques sur l'*Hymenolepis nana* et sur l'*Hymenolepis fraterna*. [**Epidemiological Researches on** *H. nana* **and** *H. fraterna*.]—*Arch. Inst. Pasteur d'Algérie*. 1929. Mar. Vol. 7. No. 1. pp. 31–50. With 1 map & 4 figs. on 2 plates. [18 refs.] [Pasteur Inst. of Algeria, Algiers.]

The line of thought runs thus. There are two names to the dwarf tapeworm given to two sets of specimens which cannot be distinguished by any morphological test, *H. fraterna* and *H. nana*. These authors hold that they nevertheless constitute two biological species, the former found in rats, mice, field mice and dormice and capable of experimental transmission to allied rodents, and the latter found in man only but experimentally capable of transmission to the rat. No tapeworm which they identify as *H. nana* or *H. fraterna* has been found in rats, mice, or any other rodent in the Algerian Sahara. *H. microstoma* has been found once in 213 mice, recognizable it is held by its genital ducts and the number of its eggs. The mouse is the only rodent found in houses and it, as noted, is free from infection. Accordingly infection with *H. nana* is carried directly from man to man.

C. L.

Romeo (Nunzio). Un caso di associazione di *Hymenolepis nana* e *diminuta*. [**A Case of Infection by** *Hymenolepis nana* **and** *H. diminuta*.]—*Arch. Ital. Sci. Med. Colon.* 1930. Nov. 1. Vol. 11. No. 11. pp. 680–684. With 1 text fig. English summary (3 lines). [Lab. of Colonial Path., Bologna.]

A man of 26 years presented himself at the Laboratory of Colonial Pathology [nothing is said as regards symptoms or reasons for his coming for examination; in fact he was "in the best of health"]. The blood showed 6 per cent. eosinophiles and in the faeces were ova of *H. nana* and *H. diminuta*. This was the third such case seen at the laboratory. He had travelled considerably in Italy, but the source of infection could not be determined.

H. H. S.

Clark (Esther B.). **Human Infestation with the Rat Tapeworm** (*Hymenolepis diminuta*).—*Jl. Amer. Med. Assoc.* 1930. Nov. 1. Vol. 95. No. 18. p. 1342.

A boy of 4 who ate dirt, sand, leaves, sticks and toys whenever he could and who experienced abdominal pain and loss of [healthy] appetite, finally made a meal of a rubber sponge. The cathartic which deservedly followed revealed tapeworm infection, and male fern expelled 14 tapeworms in a mass. Since then "his appetite is vastly better."

C. L.

Ingall (Morris) & Freeman (Harry). **The Prevalence of Tapeworm Infestation in Jewish Patients.**—*New England Jl. of Med.* 1930. Apr. 3. Vol. 202. No. 14. pp. 679–681. [6 refs.]

The patients number 9, 8 women of whom 6 harboured *D. latum* and 2 *T. saginata*, and 1 man with *D. latum*. Two of the broad tapeworm patients were born in and had never left the United States, 3 came from Russia and 1 from Poland; the red corpuscles varied from 3,880,000 to 5,450,000; in only 2 cases was there an appreciable rise of eosinophils, namely to 5 and 18 per cent.

C. L.

Denham (A. A.). *Taenia saginata* **Infection.** [Memoranda.]—*Brit. Med. Jl.* 1930. July 19. p. 101.

The real interest of the case lies in the toxic symptoms following treatment. A dose of one and a half drachms [6 cc.] of extract of male fern on an empty stomach produced within 10 minutes of taking it collapse, coma and twitching in a Jewess of 56. A stuporous state continued for 2 hours. The bowels then moved and consciousness was recovered. A *T. saginata*, identified by Leiper, was later passed.

C. L.

Eguchi (Suyeo) & Nishiyama (Iori). Studien über *Taenia solium*. [**Studies on** *T. solium*.]—*Trans. Japan. Path. Soc.* 1930. Vol. 20. pp. 577–579. [Med. High School, Osaka.]

In slaughtered swine, the annual numbers between 1916 and 1929 lying between 16,000 and 24,000, the percentage infected with *Cysticercus cellulosae* was highest in 1926, namely 2·71 per cent., and in 1929 was 0·94 per cent. Muscle, heart, brain, orbit and tongue were infected in that order, but in 42 infected carcasses the muscles were free in 9 only. Hooks on the scolex might be as low as 9 and on the

onchosphere as many as 8. In man 25 cases of infection by the strobilus are recorded [the number examined being unstated].

C. L.

Cameron (T. W. M.). **A New Record of the Occurrence of a Tapeworm of the Genus *Bertiella* in Man.**—*Jl. Helminthology.* 1929. Dec. Vol. 7. No. 4. pp. 231–234. [3 refs.]

A tapeworm was recovered by Dr. S. B. Jones from a young negress who had never left St. Kitts, B.W.I. Cameron found it to be a Bertiella, and recovered young specimens of Bertiella from one of the West African green monkeys with which the island is overrun. The question of identity of *B. studeri* of the Old World and *B. mucronata* of the New is considered.

C. L.

Maplestone (P. A.). **A New Case of *Bertiella studeri* in a Human Being.**—*Indian Med. Gaz.* 1930. May. Vol. 65. No. 5. pp. 258–260. With 2 text figs. [5 refs.] [School of Trop. Med. & Hyg., Calcutta.]

After filix mas 28·9 cm. of strobilus was found but no head. The structure was that of *B. studeri* but the mature segments measured 14·5 mm. long by 3 mm. broad. Maplestone points out that the superficial area is 4·35 sq. mm. as compared with the 4·5 sq. mm. of Faust's specimen with its measurements of [0·75] by 6 mm.; and suggests that the area of a segment is likely to prove a better diagnostic guide for the motile cestode than the length and breadth.

C. L.

Cuff (Cyril H.). **Forty Cases of Hydatid Disease.**—*Brit. Med. Jl.* 1930. Oct. 11. pp. 599–600.

Of these 40 operations reported from Cyprus, in 31 the cyst was in the liver, 3 in the lung, 3 in the omentum, and 1 each in thigh, ischio-rectal fossa and uterus. The last had metrorrhagia, daughter cysts loose in the vagina, and more expelled through the patulous os on pressure. X-rays, complement fixation and Casoni reaction were all used in diagnosis. Eosinophilia was present in half the cases.

C. L.

Loucks (H. H.). **Hydatid Cyst. A Review and a Report of Cases from North China.**—*Nat. Med. Jl. China.* 1930. Aug. Vol. 16. No. 4. pp. 402–496. With 31 figs. on 18 plates. [156 refs.] [Peiping Union Med. College, Peking.]

The subject is considered at length and 16 cases described. In 11 the diagnosis was confirmed at operation. In them the liver was infected in 10, with simultaneous infection of the peritoneum in 2, of the spleen in 1, and of the spleen and femur in 1; the orbit was infected in 1. Of 5 cases clinically diagnosed the liver was infected alone in 3, the liver and spleen in 1, and the lung in 1.

C. L.

Willis (Rupert A.). **Some Diagnostic Difficulties in Hydatid Disease.**—*Med. Jl. Australia.* 1930. June 21. 17th Year. Vol. 1. No. 25. pp. 810–813. With 4 figs. on 1 plate.

Seven cases are described in detail in which hydatid infection went undetected, at least for a time. The moral is that this condition should

be considered in obscure pulmonary states in which tubercle bacilli are not detected, particularly if the puzzling condition is at the bases ; when there are abdominal masses particularly in the liver with no apparent primary growth ; and when there are bone lesions recalling tubercle or other inflammatory disease.

C. L.

Mollow (W.). Die Bedeutung der Reaktion nach Casoni für die Diagnose der Echinococcenkrankheit des Menschen und ihre Einwirkung auf die anderen biologischen Reaktionen. [**Significance of Casoni Reaction for Diagnosis of Echinococcal Disease in Man and its Influence on Other Reactions.**]—*C. R. Congrès Internat. de Méd. Trop. et d' Hyg. Le Caire, Egypte, Décembre, 1928.* Vol. 2. pp. 649–659.

The author concludes that of biological reactions for the detection of hydatid infection the Casoni reaction, by reason of its certainty and ease, is the best. It can produce far-reaching cellular and humoral changes, such as eosinophilia in predisposed persons and a Weinberg's reaction. The Casoni reaction is most sensitive, but whether it is specific or non-specific only further tests can show.

C. L.

v. Hecker (Hans) & Kellner (Frank). Zur Diagnostik der Lungenzystizerkose beim Lebenden. [**Diagnosis of Pulmonary Cysticercosis during Life.**]—*Fortschr. Geb. Röntgenstrahlen.* 1929. Vol. 39. No. 4. pp. 624–628. With 4 figs. [6 refs.]

A suspected pulmonary tuberculosis showed to the X-rays a number of defined round shadows in the lungs. This is stated to be the third case of pulmonary cysticercosis diagnosed during life.

C. L.

Banerji (Kumaresh Chandra). **Tape-Worm Infection causing Abdominal Tumours.**—*Calcutta Med. Jl.* 1930. Sept. Vol. 25. No. 3. pp. 130–131.

A single doughy mass disappeared simultaneously with passage of many segments of *T. saginata*. The man said he had not taken beef for at least 8 years, but was in the habit of taking pork.

C. L.

Miller (Harry M.) Jr. **Experiments on Immunity of the White Rat to** *Cysticercus fasciolaris.*—*Proc. Soc. Experim. Biol. & Med.* 1930. June. Vol. 27. No. 9. p. 926. [Zool. Dept., Washington Univ., St. Louis, Mo.]

By small intraperitoneal injections of dried pulverized worm material at 2 to 3 days intervals it was found that, in animals fed with onchospheres 5 weeks later and examined a month afterwards, the young worms were for the most part dead, and measured on the average 1 mm. in diameter ; whereas in controls fed with the same quantities of the same suspension of onchospheres they averaged 2 to 5 mm. in diameter. There is some evidence too that the presence of one or more relatively huge cysts confers immunity to a superinfection.

C. L.

Hasegawa (K.). Ueber einen Trichostrongylus (*T. instabilis*, Railliet, 1893) aus dem Kaninchen. [**A Trichostrongylus from the Rabbit and its Development.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1929. Aug. No. 293. [In Japanese. German summary pp. 37–39.]

——. Ueber die Entwicklungsgeschichte des *Trichostrongylus instabilis* und experimentelle Infectionen.—*Ibid.* [In Japanese. German summary pp. 39–40.] [Med. High School, Taihoku.]

i. Although found in rabbits Hasegawa's conclusion is that this worm actually is *T. colubriformis* [of which *T. instabilis* is a synonym] and not *T. retortaeformis*, and his description and, so far as they can be deciphered, his photomicrographs strongly support his conclusion, a matter, it may be added, of medical importance seeing how relatively frequently more exact diagnostic method shows that this nematode parasitizes man.

ii. At 18° C. to 20° C. larvae show their first ecdysis in two days, and become infective in 5 to 7 days, by which time they measure 0·729 mm. long and 0·0024 mm. broad. Infective larvae are unusually resistant to chemicals, heat and drying. After oral infection no passage through the lungs could be detected by direct examination or by tracheotomy, in rabbits, mice or dogs. Infection through the skin either failed or was effected by few larvae only even when there was a breach in the epidermis.

C. L.

Lee (C. U.). **Some Observations on** *Strongyloides stercoralis.*—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. May. Vol. 34. No. 5. pp. 262–274, With 9 text figs. [10 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Lee has attempted to confirm Nishigori's work [this *Bulletin*, Vol. 25. p. 962] and writes: "It is unfortunate that Nishigori's paper is in the Japanese language, making it difficult to examine critically his experimental techniques, which gave results so entirely different from those of previous authors." Lee's own technique consists of an extraction by Baermann's apparatus of rhabditiform larvae from fresh infected faeces mixed with coarse sterile sand; after 1 hour in the incubator at 37° C. they formed a seething white mass at the bottom of the receiving tube. From cultures direct filariform, and indirect rhabditiform and filariform larvae were collected. Lee's own check of Nishigori's reported results was negative, but he found that indirect were larger than direct filariform larvae, and that there was a difference in the size of the genital primordium of the 4 forms but no difference in the number of the constituent cells, that of the direct rhabditiform larva being the largest and of the indirect filariform larva the smallest.

C. L.

Levin (A. L.). **The Problem of Eradication of** *Strongyloides intestinalis.*—*Amer. Jl. Trop. Med.* 1930. Sept. Vol. 10. No. 5. pp. 353–363. [13 refs.] [Graduate School of Med., Tulane Univ., New Orleans.]

An experience of 28 cases in Louisiana and Mississippi led to the conclusions that no age is exempt, white males are more commonly

infected than other persons, there is a mild anaemia and eosinophilia with gastro-intestinal disturbance and biliary toxaemia, passing to diarrhoea and colic in severe cases. Gastric acidity ranges from "achylia" to mild hyperchlorhydia, and ordinarily the general health is undisturbed. The length of the infection and uselessness of present treatments are mentioned and expectation expressed as to the probable value of the intravenous route for medication.

C. L.

DE LANGEN (C. D.). Postscript about Anguillulosis and Eosinophilia. [**Strongyloidosis and Eosinophilia.**]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1929. Vol. 18. No. 2. pp. 310–314. [51 refs.]

It is noted as a sequel to a former paper [this *Bulletin*, Vol. 26, p. 543] that the presence of eosinophilia led to the finding that cases which had been held cured by tartar emetic and gentian violet relapsed, so that after this treatment repeated courses are required. Anal itching, reported by FÜLLEBORN as occurring in strongyloides cases, was noted by de Langen once only—in a European. The absence in natives is attributed to their custom of washing the anus after defaecation. The list of references was inadvertently not published with the previous paper.

C. L.

BRÜCKNER. **Anguillula intestinalis.**—*Med. Klin.* 1930. Nov. 14. Vol. 26. No. 46 (1353). pp. 1703–1704.

Strongyloides [unfortunately described as 2 to 6 cm. long] is present in the Ruhr. Six cases with weakness, giddiness, pain in head, abdomen and liver, loss of weight, eosinophilia of 6 to 30 and larvae in the stools are described, as well as others with less disturbance. All of many drugs have proved useless to expel the worm.

C. L.

DATTA (Subodh). **Infection by a Gnathostome simulating Mastoiditis.**—*Indian Med. Gaz.* 1930. June. Vol. 65. No. 6. pp. 314–315. [Carmichael Med. College, Calcutta.]

MAPLESTONE (P. A.). **A Note on the Parasite.**—*Ibid.* p. 315. [School of Trop. Med. & Hyg., Calcutta.]

A sore throat was followed by a severe earache with discharge of blood from the ear but an intact tympanic membrane; a swelling involving the right mastoid, temporal and pre-auricular regions, and both right lids; red corpuscles 2,100,000, white corpuscles 6,250, eosinophils 5 per cent. On making the usual mastoid incision a wormlike body was seen on the deep surface of the temporal muscle and the operation stopped since the bone appeared sound. Maplestone identified it as a typical full-grown male *Gnathostoma spinigerum* 15·1 mm. long. It is noted that this is the second case reported in man from India, the first by Maplestone in November, 1929, and that of the 12 human cases the sex of the worm has been noted in 4, and all were males.

C. L.

i. Doerr (R.) & Schmidt (G. W.). Studien über den Mechanismus der Trichinelleninfektion. VII. Mitteilung: Experimentelle Beeinflussung der Trichinenwanderung.—Die natürliche Immunität des Huhnes. [**Mechanism of Trichinella Infestation.**]—*Zent. f. Bakt.* I. Abt. Orig. 1929. Feb. 20. Vol. 115. No. 7/8. pp. 427–437. With 7 coloured figs. on 2 plates. [Hyg. Inst., Univ., Basle.]

ii. Feldmann (I.). Bemerkungen zu der VII. Mitteilung von R. Doerr und G. W. Schmidt: "Studien ueber den Mechanismus der Trichinelleninfektion."—*Zent. f. Bakt.* I. Abt. Orig. 1930. July 28. Vol. 117. No. 7/8. pp. 498–499.

i. It is found that infiltration of a masseter with tartar emetic solution prevents invasion by trichinella larvae. In guineapigs, larvae have entered striped muscle fibres within 8 hours of the intestinal trichinella being injected into the muscle, and after a week they have grown but not rolled up. In fowls and pigeons feeding on measly meat produces no invasion of muscle, but adult forms are found in the gut 10 or 12 days after feeding; if, however, adult females are injected into the muscle, larvae enter the fibres as they do in guineapigs.

ii. Feldmann points back 39 years to the work of v. Genersich, published in the *Hungarian Medical Weekly* (*Orvosi Hetilap*) of 1891, who found that muscular infection with trichinella did not take place in ducks, pigeons and fowls, but that in ducks the intestinal forms could be found for less than 6 days whereas in pigeons they persisted 7, 9, 10 or even 22 days. He also investigated the intestinal reaction.

C. L.

Gatowskaja (R. G.) & Kasakoff (P. T.). *Trichocephalus dispar* und seine radikale Behandlung mit Osarsol. [*T. dispar* **and its Radical Treatment with Osarsol.**]—*Wien. Klin. Woch.* 1930. July 17. Vol. 43. No. 29. pp. 906–908. [17 refs.]

The authors cured 28 of 36 trichuris infections by osarsol, which is a stovarsol synthesised in Russia. The dose was 0·5 gm. in tablet form three times daily for 3 consecutive days preceded by two days of liquid diet and followed by a purge. Telemann's method of faecal examination was used and was repeated several times before cure was accepted.

C. L.

Skrjabin (K. I.), Podjapolskaya (W. P.) & Schichobalowa (N. P.). Neue Fälle der Hepaticolosis beim Menschen. [**Hepaticola Infestation in Man.**]—*Russian Jl. Trop. Med.* 1929. Vol. 7. No. 7. pp. 449–450. With 1 text fig. [3 refs.] [In Russian. German summary p. 450.]

The three cases, in Amur, were recognized by finding in the faeces eggs measuring 58 μ by 30 μ. The exact criteria by which the eggs of *Hepaticola hepatica* were distinguished from those of *Trichuris trichiura* are not given, but it is stated that although resembling the latter they differed from them so sharply that there could be no doubt that they belonged to one of the species of *Hepaticola*. Nothing is mentioned regarding source of infection, nor apparently were rats examined.

[The finding of hepaticola eggs in the faeces is unexpected. If these rather large eggs were those of this parasite, perhaps they had been taken swallowed in food.]

C. L.

Troisier (J.) & Deschiens (R.). L'hépaticoliase. [**Hepaticoliasis.**] —Reprinted from *Ann. de Méd.* 1930. Apr. Vol. 27. No. 4. pp. 414–425. With 2 text figs. [24 refs.]

Because hepaticola eggs average 51·5 μ in length in the chimpanzee as against 55 μ in the rat, the writers designate a new species *H. anthropopitheci* and suggest that it is uncertain which form parasitizes man. The eggs are laid within the parenchyma of the hepatic lobule and are not excreted through bile and faeces. Some are destroyed in the liver, giant cells entering by the terminal pores and devouring the contents; others are shut in by cellular infiltration ending in cirrhosis, the effect on the host depending on the extent of oviposition. Though the adult worms speedily die and are absorbed, eggs may live for two years so that they may presumably be passed on by cannibalism or by being swallowed inadvertently after decomposition of the host.

C. L.

Vogel (Hans). Ueber die organotropie von *Hepaticola hepatica.* [**The Organotropy of** *H. hepatica.*]—*Ztschr. f. Parasitenk.* 1930. May 13. Vol. 2. No. 4. pp. 502–505. [3 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Rats were fed on eggs of *H. hepatica.* Six to twelve days later their livers contained larvae of the worm, and these livers were fed to nine rats. In none of these nine rats was any infection established, so that so far as this stage of development goes cannibalism seems to have no hand in passing on infection. When infective larvae were extracted from such livers and injected into the wall of stomach, prestomach, spleen, lung or subcutaneous tissue, no development occurred in these sites, though it might occur in the liver. It is concluded that larvae reach the organ by the blood stream and, finding conditions suitable, settle there.

C. L.

Momma (Kenji). **Notes on Modes of Rat Infestation with** *Hepaticola hepatica.*—*Ann. Trop. Med. & Parasit.* 1930. Apr. 7. Vol. 24. No. 1. pp. 109–113. With 1 graph in text. [12 refs.] [Med. College, Osaka, Japan.]

H. hepatica was found in the livers of 57·2 per cent. of 2,222 "house rats," but the eggs could not be detected in the contents of the intestinal canals of twenty-nine of them which were examined. The degree of infection was seasonal, highest in spring, least in summer. The eggs were found in the recta of 5 of 503 cats employed in destroying rats in a hide factory. Flies, fed on rats' livers, carried eggs on their bodies to the extent of 32·9 per cent. and in their guts to 63·9 per cent. and the eggs remained viable after passing through the alimentary canal of cat or fly or being dried. The fly is accordingly believed to be chief agent in transmission [a conclusion at variance with the suggestion that propagation depends on cannibalism].

C. L.

MacArthur (W. P.). **Threadworms and Pruritus Ani.**—*Jl. Roy. Army Med. Corps.* 1930. Sept. Vol. 55. No. 3. pp. 214–216.

MacArthur insists that in nocturnal pruritus ani the first cause to exclude is enterobius, which, as he graphically describes, can be caught at its irritating misdeeds, if at the time a quick examination with a

flashlight is made. The movements of these females actually cause "an intolerable, light, rapid tickling." The treatment strongly advised is a two ounce injection of kitchen salt—two tablespoonfuls to a pint—which is only really effective when pruritus is felt. It is repeated nightly or as often as pruritus is felt and if this continues longer than 6 weeks self-infection is probable. In this connexion MacArthur mentions finding fragments of a worm and several dozen eggs under a single fingernail. The injection ensures a peaceful night. The hands must be scrubbed immediately on waking and whenever the underclothing or skin has been touched.

C. L.

VonderMühll (R.). Erfahrungen mit Antivermol in der Kinderpraxis. [**Antivermol in Pediatrics.**]—*Schweiz. Med. Woch.* 1930. Mar. 29. No. 13. pp. 299–300. [Children's Hosp., Basel.]

Antivermol was given in pill form 3 times a day before food to children whose mothers had seen threadworms in the stools. There are two sizes of pill suited to different ages. The subjective symptoms disappeared in 3 or 4 days but the first course of treatment was continued for 10. After an interval it was repeated, more than once if necessary. No ill effects were noted in 110 cases and of them 29 were held cured after 10 days, 27 after 3 weeks and 32 after a month. The other 22 ceased attendance.

C. L.

Durand (Gaston). Traitement de l'oxyurase. [**Treatment of Oxyuriasis.**] —*Marseille-Méd.* 1929. Dec. 5. Vol. 66. No. 34. pp. 712–713. [3 refs.]

For 3 days, purgation and a mixture of equal parts of syrup of nerprun* and tincture of jalap. The dose for an adult is 2 dessertspoonfuls on the first day and 2 tablespoonfuls on the second and third. There follows a rest of 5 days and then a laxative treatment. For children the dose is 2 teaspoonfuls daily for 3 days. The treatment should not be used in those with colitis.

C. L.

Goodale (Raymond H.) & Krischner (Harald). *Oxyuris vermicularis* **in the Peritoneum.**—*Arch. Pathology.* 1930. Mar. Vol. 9. No. 3. pp. 631–634. With 1 text fig. [19 refs.] [Path. Dept., American Univ., Beirut.]

A seventh is added to the known, and harmless, cases of *E. vermicularis* found encysted in the peritoneum, all women, the worm having presumably reached this site through the genital tract. The cases in which the worm has been found in an abscess of the intestinal wall are discussed.

C. L.

Bacigalupo (J.). Oeufs de *Oxyuris incognita* ou *Heterodera radicicola*. [**Eggs of** *H. radicicola*.]—*C.R. Soc. Biol.* 1930. Oct. 16. Vol. 105. No. 27. pp. 118–119. With 1 text fig. [5 refs.]

H. radicicola eggs are reported from human faeces in Buenos Aires. Other reports from Australia, California and New Orleans are mentioned, but London is omitted.

C. L.

* A corruption of *noire prune*, prepared from the berries of *Rhamnus cathartica*.

King (H. H.), Pandit (C. G.), Menon (K. P.) & Iyer (P. V. Seetharama). **A House-to-House Filariasis Survey in Saidapet, 1927-1928, and a Note on the Source of Filarial Infection in Mosquitoes.**—*Indian Jl. Med. Res.* 1929. Oct. Vol. 17. No. 2. pp. 406–420. With 1 map & 4 figs. in text & 1 plate. [6 refs.] [King Inst. of Preventive Med., Guindy, Madras.]

Of 1,633 persons examined 4·27 per cent. had elephantiasis and 2·33 had other clinical evidences of filariasis (fever and lymphangitis, enlarged glands and enlarged testis or hydrocele) and 16·3 per cent. microfilariae in the blood. While clinical filariasis and elephantiasis were commonest at ages over 40, microfilariae were commonest between 21 and 30, while of 57 elephantiasis cases only 1 had microfilariae, and he was a slight and early case; this is attributed to the development of a reaction in the body against filariae and microfilariae.

Regarding captured mosquitoes, filarial development was found to occur only in *Culex fatigans* and 34·6 per cent. of 1,741 of them were found infected with microfilariae. These were *Mf. bancrofti* for the following reasons: Their structure corresponded; only mammalian blood was found by the microscope, and by serological tests only that of man and bovines; *C. fatigans* could not be infected from dogs containing *Mf. immitis* or *Mf. recondita*, only light infections being, however, recognized in the dogs, nor from calves containing microfilariae. Accordingly it is concluded that the microfilariae found in *C. fatigans* were those of *F. bancrofti* obtained from man. It is suggested that filariasis is associated with occupational damage to lymphatics, the microfilaria rate being: in dhobies who stand washing clothes in water 9·1, in weavers who sit for hours moving their looms with their legs 23·5, in shopkeepers who sit for hours cross-legged 26·5, in skilled labourers 3·1 and in clerks 10·0.

C. L.

Korke (Vishnu T.). **Observations on the Correlation between the Incidence of Filarial Infection in the Human Host and in the Insect Carrier in Relation to Terrain. Part V.**—*Indian Jl. Med. Res.* 1930. July. Vol. 18. No. 1. pp. 319–331. With 1 map. [8 refs.] [Central Research Inst., Kasauli.]

——. **Observations on the Characters of Filarial Endemic Areas in Bihar and Orissa. Part VI.**—*Ibid.* pp. 333–336. [7 refs.] [Central Research Inst., Kasauli.]

F. bancrofti infection lessens in intensity in Bihar and Orissa from the sea coast through the Gangetic plain to the submontane arable areas. Of mosquitoes Korke has implicated *C. fatigans* alone as intermediate host, its infection being highest in June and July. Areas of paddy cultivation appear to be endemic centres.

C. L.

Korke (Vishnu T.). **Observations on the Natural History of *F. bancrofti* in Dwellings in Relation to the Systems of Drainage. Part VII.**—*Indian Jl. Med. Res.* 1930. Oct. Vol. 18. No. 2. pp. 427–442. [2 refs.] [Central Research Inst., Kasauli.]

The drainage headings considered are cement drains, non-cement drains, cesspool, and no system. *Culex fatigans* is the mosquito

concerned and is domestic. Any system of drainage may lead to accumulation of water with breeding, but a neglected cement drain is the most frequent accompaniment of filarial infection. The first step in prophylaxis is to keep the cement drain and cesspool systems in strict sanitary order.

C. L.

Rao (S. Sunder) & Iyengar (M. O. T.). **Studies on the Influence of Season on the Development of** *Filaria bancrofti* **in** *Culex fatigans*.—*Indian Jl. Med. Res.* 1930. Jan. Vol. 17. No. 3. pp. 759–767. With 1 text fig. & 5 figs. on 2 plates. [4 refs.]

This laboratory work was carried out in Calcutta. The technique is described. The percentage and intensity of infection and the time taken for larvae to complete their development in *Culex fatigans* varied with the season. High temperature and humidity whether naturally or artificially produced give the highest infections. Microphotographs show how heavy the infection could be.

C. L.

Rao (S. Sundar). **Records of Findings of Adult** *Wuchereria* (*Filaria*) *bancrofti* **in India.**—*Indian Med. Gaz.* 1930. Sept. Vol. 65. No. 9. pp. 481–483. With 4 text figs. [6 refs.]

Rao states that the finding in India of adult *F. bancrofti* has been recorded in four papers only—Lewis 1877, Sibthorpe 1889, Maitland 1894, Cruickshank and Wright 1913–14. He records six cases with microphotographs.

C. L.

Acton (H. W.) & Rao (S. Sundar). **Factors which determine the Differences in the Types of Lesions produced by** *Filaria bancrofti* **in India.**—*Indian Med. Gaz.* 1930. Nov. Vol. 65. No. 11. pp. 620–630. With 3 maps, 1 text fig. & 5 plates. [9 refs.]

Six areas in India have been investigated. Stress is laid on the "effective period of infection." Filaria larvae require certain conditions of temperature and moisture for their optimum development in culex. If the climate is such that these fully coincide with the breeding season of culex, filariasis is great. In proportion as there is not full coincidence filariasis lessens. The first constitute hyperendemic areas and in them the immature filariae, if injected by culex in numbers, produce irritation of the first gland encountered, usually the groin gland, in the form of periadenitis and conversion of the gland into granulation tissue, followed by fibrotic shrinking, often with adult filariae in the hilum of the gland. The result is elephantiasis. In moderate endemic areas it is held that the immature filariae block, not the first gland encountered but, in the case of the lower limbs, the juxta-aortic. The result is hydrocele primarily, and gland changes are less intense. The age at which lesions begin to occur is earlier the greater the endemicity. Further variations in the intensity of the lesions produced by *F. bancrofti* are dependent on two factors, the degree of helminthic and of coccal infections.

C. L.

Acton (H. W.) & Rao (S. Sundar). **The Causation of Lymph-Scrotum.** —*Indian Med. Gaz.* 1930. Oct. Vol. 65. No. 10. pp. 541–546. With 4 text figs. & 1 coloured plate. [7 refs.]

Elephantiasis of the scrotum and lymph scrotum are each described and illustrated, though the legends to the reproduced photographs of these conditions have evidently been transposed. Nine cases of lymph scrotum are described, and in every one there had been an antecedent operation for hydrocele. The view taken, after a study of the anatomy of the lymphatic system of the abdomen, is that a hydrocele or chylocele is really an overflow reservoir for lymph dammed back by fibrosed lymph nodes, and that when the sac is removed its function is taken up by a dilatation of the lymph vessels as a lymph scrotum, which is accordingly man made. In seven cases in which both lymph from the oozing scrotum and the peripheral blood were examined, microfilariae were present in all cases in the lymph and only once in the blood.

C. L.

Banerjee (Kali Gati). **Filarial Periodicity.**—*Indian Med. Gaz.* 1930. Mar. Vol. 65. No. 3. pp. 144–149. With 2 text figs.

The term periodicity is used in this paper in two senses; the first is that of attacks of filarial illness in which, in the author's view, the moon is of essential importance, the symptoms coming at the new moon, or at the full moon or at the quarter, or on the 11th day [or indeed, taking the other suggested causes into consideration, probably on any day of the moon].*

The second sense in which periodicity is used is the ordinary one, the hour of the day at which embryos are found in the peripheral blood. [While adding certain errors of transcription or sense this paper follows precisely the detailed order of and even uses the same words as that of the reviewer (this *Bulletin*, Vol. 26, p. 981) on "The mechanism of filarial periodicity," which however it does not mention. One gets more and more used to these extraordinary coincidences.]

C. L.

Acton (H. W.) & Rao (S. Sundar). **Urticaria due to Filarial Toxin.**—*Indian Med. Gaz.* 1930. Mar. Vol. 65. No. 3. pp. 130–132. [5 refs.]

In their work between 1926 and 1929 Acton and Rao "have observed several characteristic cases of urticaria which could be definitely ascribed to infection by *Filaria bancrofti* . . . evidently the first records of such a manifestation of filarial infection." The cases number seven, five had microfilariae in the blood, all showed moderate eosinophilia, there was no sensitiveness to particular food proteins

* "The weather depends on the moon as a rule, and I've found that the saying is true,
"For at Bala it rains when the moon's at the full, and it rains when the moon's at the new.
"When the moon's at the quarter then down comes the rain; at the half its no better, I ween;
"When the moon's at three-quarters it's at it again—and it rains besides mostly between."

except in one who showed marked reaction to almost every test. The periodicity of the rash was sometimes a daily one, sometimes irregular. Its appearance is attributed to liberation of toxins during embryoposition and it is held that study of its incidence should give definite knowledge whether embryos are posited continuously or periodically.

C. L.

CERQUA (Saverio). Akute eitrige Epididymitis und Deferentitis bei Filariasis. [**Acute Suppurative Epididymitis with Filariasis.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. July. Vol. 34. No. 7. pp. 354–357. With 3 text figs. [Umberto I Italian Hosp., Cairo.]

Stating that the Calcutta school holds that filariae do not themselves produce changes in the body but merely act as foreign bodies, and that when acute complications arise it is as the result of an added staphylococcus infection, Cerqua ranges himself on their side. Operation disclosed that an inflammatory condition of two months standing was caused by a little-altered testis, a thickened tunica vaginalis, an epididymis in which the seminal canals were as much as 0·5 cm. in diameter and full of creamy pus and the connective tissue full of inflammatory cells, and a thickly infiltrated cord. A female filaria was found in the testis itself and comment is made on the slight changes in this organ as compared with those in the epididymis and cord, and it is suggested that their altered condition hindered the detection of worms which may have lain in them.

C. L.

TALIAFERRO (William H.) & HOFFMAN (William A.). **Skin Reactions to *Dirofilaria immitis* in Persons infected with *Wuchereria bancrofti*.**—*Jl. Preventive Med.* 1930. July. Vol. 4. No. 4. pp. 261–280. [18 refs.] [School of Trop. Med., Univ. of Porto Rico, San Juan, & Dept. of Hyg. & Bact., Univ., Chicago.]

"A large proportion of persons infected with *Wuchereria bancrofti* exhibit a positive immediate skin reaction to the intradermal injection of about 0·025 cc. of a 0·5 per cent. saline extract of dried, powdered *Dirofilaria immitis*. Control tests with other parasitic extracts were negative. Using the possession of pseudopods by the urticarial wheal as the criterion of positiveness, 23 known infected persons showed 19 positives, 56 possibly infected showed 38 positives, 22 probably uninfected showed 1 positive, and 19 known uninfected showed no positives. Using as the criterion of positiveness the possession of pseudopods by the wheal or a wheal 10 mm. or larger in diameter with a concomitant negative to some other parasitic extract, the 23 known infected persons showed 21 positives, the 56 possibly infected showed 46 positives, the 22 probably uninfected showed 1 positive, and the 19 known uninfected showed no positives."

Age has no effect on reaction. Local sensitivity was transferred to 5 of 11 persons by injection of serum of a sensitive person. There were very few delayed reactions. Skin reactions with extracts of *D. corynodes* and of a filaria from a cebus were unsatisfactory.

C. L.

Suarez (Jenaro). **A Preliminary Report on the Clinical and Bacteriological Findings in 60 Cases of Lymphangitis associated with Elephantoid Fever in Porto Rico.**—*Amer. Jl. Trop. Med.* 1930. May. Vol. 10. No. 3. pp. 183–198. With 5 text figs. [4 refs.] [Presbyterian Hosp., San Juan, Porto Rico.]

Cultures were taken from 60 patients during acute lymphangitis. In ten cultures taken from septic foci, *Streptococcus haemolyticus* was found 9 times and *Staph. aureus haemolyticus* once. Only 2 of 50 cultures taken from subcutaneous tissues were positive; both for *Strept. haemolyticus.*

"A case of lymphangitis is very rarely seen without a septic focus of infection of the part affected. . . . It is really astonishing the enormous number of lesions found on careful examination of the feet of dispensary patients. . . . From experience I have invariably found that by treating or removing the foci of infection patients remain free of the lymphangitis for months. Microfilariae were never found in the blood of these patients. . . . Filariasis as a factor in production of elephantiasis is not as important as was formerly thought."

C. L.

Minami (Seigo) & Ehara (Ichiro). Ueber den positiven Filarienbefund bei einem Fall von Chylurie und die histologischen Veränderungen der Niere bei 2 Fällen. [**Finding of Filaria in One Case of Chyluria and Histological Changes in the Kidneys in Two Others.**]—*Japan. Jl. Dermat. & Urol.* 1928. Mar. Vol. 28. No. 3. pp. 283–303. With 2 text figs. & 4 figs. on 1 plate. [51 refs.] [In Japanese. German summary pp. 14–15.] [Skin Clinic, Univ., Okayama.]

In all the four cases of chyluria described, the leakage of chyle was from the left ureter and the function of that kidney was slightly damaged. Microfilariae were present neither in the night blood nor in the urine. In two the chylous urine coagulated and the left kidney in each had to be removed on account of the discomfort so produced. In one case a female filaria apparently alive was found in a lymphatic gland about the hilum of the kidney, with microfilariae in the fluid about it, so that chyluria without microfilaraemia does not exclude filariasis. The kidneys showed hyaline degeneration of the convoluted tubules, with exuded plasma in the lumen and in many Bowman's capsules. In the literature, it is noted, changes in the kidney are obvious in 76·5 per cent. of chylurias. There was marked dilatation of the lymphatic vessels of and haemorrhage into the submucosa of the pelvis of the kidney and upper part of the ureter.

C. L.

Phelps (J. R.), Smith (O. A.), Carroll (H. H.), Washburn (W. A.) & Beagley (K. E.). **Experimental Treatment of Filariasis with Intramuscular Injections of Oil of Chenopodium. A Preliminary Report by the Technical Staff of the Health Department of American Samoa.**—*U.S. Nav. Med. Bull.* 1930. Apr. Vol. 28. No. 2. pp. 459–487.

After general remarks the authors describe the intramuscular injection, usually weekly, of oil of chenopodium, or seemingly ascaridole, into 338 subjects of filariasis about half of whom had microfilariae, here non-periodic, in the blood. "Fresh blood smears are taken from each patient once a week. In many cases bloods formerly positive

every week have become negative after several injections. We can not draw any conclusions from that fact, because there comes a time in many cases when microfilariae disappear from the peripheral circulation, especially in cases where there is elephantiasis." Attacks of filarial fever have usually ceased about the 5th injection and capacity for work has increased. The dosage was 0·5 cc. increasing by weekly increments of 0·5 cc. to 2 cc. into the gluteus. There was often heavy protein shock, namely very severe general reactions with rigors, and a temperature of 103° F. coming on in 24 to 30 hours, and also in a third of the cases severe pain and swelling over the injection. The treatment was most popular.

C. L.

KIDD (Frank). **Surgical Treatment of Chyluria and Filariasis.**—*Brit. Jl. Urol.* 1930. Mar. Vol. 2. No. 1. pp. 15–26. With 1 fig. [24 refs.]

Two cases are described. A woman of 69 who had lived for 30 years in Mauritius in her youth, suddenly showed a *Bact. coli* infection of the right kidney, and later a chyluria coming from that organ. Abdominal nephrectomy revealed no dilated abdominal lymphatics, there was an S-shaped kink in the ureter, the pelvis was a distended sac. The kidney was removed with cure of chyluria and bacilluria. No microfilariae had been found in blood or urine. In the second case the left tunica vaginalis was filled with milky fluid, while distended cord lymphatics contained clear fluid with active microfilariae. After excision of the sac drainage was arranged for and persisted for 3 weeks, discharge then spontaneously ceasing. "In cases of unilateral renal chyluria causing profound wasting or other complications that endanger life or render it unendurable nephrectomy is justifiable." An X-ray picture of a chyluric kidney injected with sodium iodide is reproduced from A. H. WOOD in which the opaque medium is described as entering two lymphatic channels coursing towards the mesial abdominal lymph nodes. "Curiously enough the taking of the pyelogram cured the chyluria" [so that, from whatever reason, the chyluria ceased without operation in this case].

C. L.

BOYD (T. C.) & ROY (A. C.). **The Cholesterol Content of the Blood in Filaria.**—*Indian Jl. Med. Res.* 1930. Jan. Vol. 17. No. 3. pp. 949–951. [2 refs.]

The normal blood cholesterol is 0·116 per 100 cc. In 50 cases with microfilariae in the blood or with filarial diseases it varied between 0·12 and 0·22.

C. L.

CHOPRA (R. N.), CHOUDHURY (S. G.) & RAO (S. Sunder). **Studies in the Physical Properties of Different Blood Sera. Part IV. Filariasis.**—*Indian Jl. Med. Res.* 1930. July. Vol. 18. No. 1. pp. 27–33. [5 refs.] [School of Trop. Med. & Hyg., Calcutta.]

"Density, viscosity, surface tension and buffer action of sera from the blood of normal persons and filariasis patients have been determined. It has been found that the surface tension and buffer action of filariasis sera are somewhat diminished, while density and viscosity are not changed at all."

C. L.

HAGA (J.). Over filariasis in Ned.-Indië, met name op de Westkust van Sumatra en de Zuideren Ooster-Afdeeling van Borneo (Onderafdeeling Zuid-Hoeloe-Soengai). [**Filariasis in Netherlands India.**] —*Geneesk. Tijdschr. v. Nederl.-Indië.* 1929. Aug. 1. Vol. 69. No. 8. pp. 763–771. [1 ref.]

Examinations of thick drop preparations of night blood from 181 persons, mostly prisoners, in four localities on the west coast of Sumatra showed percentages of infection between 3·1 and 39·8 with an average of 26. In the south and east districts of Borneo, from which nine cases are described in detail, filariasis and elephantiasis are widespread. When working on a mass scale the unsatisfactory results obtained by examining 1 cc. of blood lead naturally to the removal by venipuncture of 5 or 10 cc., which can be effected for a large number of persons in a short time if there are plenty of needles and centrifuge tubes. The species of filaria is to be investigated. C. L.

BRUG (S. L.) & DE ROOK (H.). Filariasis in Ned.-Indië. II. De overbrenging van *Filaria malayi*. [**Transmission of** *F. malayi*.]— *Geneesk. Tijdschr. v. Nederl.-Indië.* 1930. May 1. Vol. 70. No. 5. pp. 451–472. With 18 figs. on 3 plates, 1 text fig. & 2 diagrams. [8 refs.] English summary pp. 472–473.

Taeniorhynchus (*Mansonioides*) *annulipes* and *T.* (*M.*) *annulatus* acquired experimental infections with *F. malayi* to the extent of 93 and 83 per cent. respectively, the corresponding natural infections being 1·2 and 1·9. In view of the enormous prevalence of these two mosquitoes, even such small indices suffice to explain the widespread filariasis which exists. Probably *T.* (*M.*) *uniformis* and *T.* (*M.*) *annuliferus* will prove capable of carrying the microfilaria. In *T. coquillettidia giblini* and some *Aedes* and *Culex* no noteworthy development occurred. C. L.

KLOTZ (Oskar). **Nodular Fibrosis of the Spleen associated with** *Filaria loa*.—*Amer. Jl. Trop. Med.* 1930. Jan. Vol. 10. No. 1. pp. 57–64. With 2 figs. [6 refs.] [Path. Dept., Univ., Toronto.]

The lesions were found in two Africans. *Mf. loa* was found in the blood of one before death ; that of the other was not examined. On section the spleens were marbled or studded with pin-point yellowish spots. Microscopically there was diffuse fibrosis becoming denser in places. The Malpighian bodies were very small or had apparently disappeared, the lymphocytes being largely replaced by endothelial cells with fibrosis along the sinus walls. In other parts nodular masses of fibrosis with eosinophils surrounded the sinuses and in the latter many well-stained *Mf. loa* were encountered. C. L.

CHANDLER (Asa C.), MILLIKEN (Gibbs) & SCHUHARDT (Victor T.). **The Production of a Typical Calabar Swelling in a Loa Patient by Injection of a Dirofilaria Antigen, and Some Comments on the Nature of Calabar Swellings.**—*Amer. Jl. Trop. Med.* 1930. Sept. Vol. 10. No. 5. pp. 345–351. [4 refs.] [Rice Inst., Houston, Texas.]

A woman returned to the United States from the Belgian Congo with Calabar swellings and wandering loa worms. One such worm was seized

in the conjunctiva and extracted damaged. It was believed to be a male. There was immediate swelling of the lids and appearance of 3 Calabar swellings—on wrist, shoulder and sole of foot. Injection of 0·05 cc. of a 1 per cent. extract of dried *Dirofilaria immitis* produced in 20 minutes a circumscribed red itchy oedematous swelling about the size of half a hen's egg. In 24 hours two-thirds of the under side of the arm was involved, and the shoulder joint ached. Adrenalin, minims ij, caused marked improvement within half an hour, which "affords strong, if not conclusive evidence for the allergic nature of these swellings, as first suggested by Fülleborn."

C. L.

Lan-Chou (Feng). **Experiments with *Dirofilaria immitis* and Local Species of Mosquitos in Peiping, North China with a Note on *Lankesteria culicis* found in *Aedes koreicus*.**—*Ann. Trop. Med. & Parasit.* 1930. Oct. 22. Vol. 24. No. 3. pp. 347–366. With 9 figs. on 2 plates. [7 refs.] [Peiping Union Med. College, Peking.]

"Microfilariae of *Dirofilaria immitis* undergo their development experimentally in *Anopheles hyrcanus* var. *sinensis* and *Aedes koreicus*. The microfilariae pass into the malpighian tubes within one to twenty-four hours after feeding. At a temperature of 25°–28° C. the whole development is completed in ten to fifteen days, and between twelve and fifteen days they proceed forward to the labium. The mature larvae have been seen proceeding to the legs, in the head above the pharynx, and sometimes even in the palpi. At different stages of development, dead and calcified larvae were observed in *A. koreicus*, but not in *A. hyrcanus* var. *sinensis*."

C. L.

i. Neuber (Edoardo). Un caso di *Filaria sanguinis hominis* a Hajdunanas (Ungheria). [**A Blood Filaria in Hungary** [?].]—*Giorn. Ital. di Dermat. e Sifil.* 1929. Aug. Vol. 70. Year 64. No. 4. pp. 757–767. With 5 plates. [6 refs.]

ii. ——. Filaria sanguinis hominis in Hajdunánás, Ungarn.—*Wien. Klin. Woch.* 1929. Oct. 31. Vol. 42. No. 44. pp. 1398–1403. With 8 text figs. [6 refs.]

iii. ——. Mit Gold- und Malariatherapie geheilte Filariose.—*Ibid.* 1930. Sept. 18. Vol. 43. No. 38. pp. 1165–1167. With 2 text figs.

i, ii. These are the same paper in two languages. The man, aged 57, had never been further from Hungary than Königgrätz, Josefstadt, Albania and Montenegro. He had had fever and rigors and showed a vesicular eruption on penis and scrotum which is illustrated, as also are sections of excised portions of the scrotal skin. Three photomicrographs show structures purporting to be microfilariae, but which appear to be artefacts. [Certainly no one with knowledge and a healthily critical mind would accept them as evidence of filariasis.]

iii. Accordingly the energetic treatment need not here be detailed.

C. L.

Grigorowa (O.) & Nesturch (M.). Filariose bei jungen Schimpansen. [**Filariasis in Young Chimpanzees.**]—*Ztschr. f. Parasitenk.* 1930. Aug. 9. Vol. 2. No. 5. pp. 616–628. With 2 text figs. [11 refs.] [Zool. Gardens, Moscow.]

In the blood of a young chimpanzee in the Moscow Zoological Garden a microfilaria was present corresponding to *Mf. perstans*. Anatomy of stained specimens and relative distances of fixed points confirm the authors' conclusions.

C. L.

Rodhain & Houssiau (F.). Les infections à *Onchocerca volvulus* chez l'Européen au Congo belge. [*O. volvulus* **Infestations in Europeans in Belgian Congo.**]—*Bull. Acad. R. de Méd. Belgique.* 1930. Feb. 22. 5th Ser. Vol. 10. No. 2. pp. 86–102. [10 refs.]

Five cases of onchocerca nodules in Europeans are noted. The subcutaneous tumours were most numerous where the skin closely overlies bone—the iliac crests, the trochanters, the ribs, the tips of the vertebral spines. In two cases they lay in the palms, but in general had no relation to sites of insect bites. They provoked no cutaneous alteration, but perhaps were associated with irregular pruritus or rheumatic pains. The absence of nodules in natives from whom microfilariae are obtained, is suggested as evidence that the former are caused by allergic reaction, unless there are two species of worm with indistinguishable and intradermal microfilariae.

C. L.

Hoffmann (Carlos C.). Ueber Onchocerca im Süden von Mexiko und die Weiterentwicklung ihrer Mikrofilarien in *Eusimulium mooseri*. [**Onchocerca in South Mexico and Development of Microfilariae in** *E. mooseri*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Sept. Vol. 34. No. 9. pp. 461–472. With 6 text figs. (1 map). [13 refs.]

The author's experience is in the south of Chiapas, the most southerly Mexican State bordering on Guatemala, in a coffee estate lying at 700 m. Cases appeared about 3 years ago, but all the people now carry microfilariae in the lymph and 86 per cent. have nodules; accordingly there may be infection without nodules. Of these, 13 per cent. are not in the head—iliac crests, ribs, shoulder blades, collar bone. Not all nodules contain worms of both sexes and a number are "sterile." Microfilariae are found throughout the body, but are massed about the nodules and those parts exposed to light and air—the face and nape of the neck. After removal of nodules microfilariae persist in the lymph at least up to 160 days. Hoffmann has once found one in the blood. Eosinophilia is marked and Calabar swellings have been found in a certain number during the first year of infection, but no "coast erysipelas." Blindness he has never seen, and attributes it to neglect of the slight initial symptoms of ocular irritation. Regarding the intermediate host, *Simulium avidum* has not been investigated, *Eusimulium ochraceum* has not been implicated at present, but in *E. mooseri* typical sausage-shaped onchocerca larvae with clearly differentiated rudiments of excretory apparatus, chyle intestine, nervous system and genital apparatus, have been observed in the thoracic muscles after 68 hours.

C. L.

Boletin de la Oficina Sanitaria Panamericana. 1930. Nov. Vol. 9. No. 11. pp. 1290–1301. With 2 maps.—Estado actual del estudio de la oncocercosis en México. [**Present State of the Study of Onchocerciasis in Mexico.**]

Investigations were carried out by the Department of Public Health in two states, Chiapas and Oaxaca. The number examined is not

given nor the population, so that the figures lose much of their value. In Chiapas 76 cases were seen, 49 men, 27 women. Cysts were commonest in the head and more than one cyst was the rule, only 19 being solitary. In Oaxaca 59 were found infected, 53 men, 6 women. This preponderance of male cases is due merely to the scarcity of women in onchocerca zones. Thirty-six of the patients had one cyst, 15 had two, the remainder up to five. Maps are reproduced showing the distribution of the cases.

H. H. S.

Brug (S. L.). *Dracunculus medinensis* **in the Dutch East Indies.**—*Meded. Dienst. d. Volksgezondheid in Nederl.-Indië.* 1930. Vol. 19. Pt. 1. pp. 153–157. With 11 figs. on 3 plates. [Central Med. Lab., Weltevreden.]

Two doubtful indigenous cases of guineaworm have been reported from the Dutch East Indies, yet there must have been importation of infection over the centuries during which there has been commerce with India and Arabia. Moreover, the almost cosmopolitan *Cyclops leuckarti* is present, and Brug infected it readily with larvae obtained from an Arab, who imported the guineaworm in his body. In this cyclops larval development followed the usual course. Cyclops containing infective larvae were fed to a gibbon, *Hylobates leuciscus*. More than a year later the apparently uninfected gibbon was killed and a full-grown female dracunculus found in the left calf. Many of these gibbons have been dissected after being used for experimental purposes in this laboratory, and no guineaworm has ever been found in them ; moreover they drink only tap water in the laboratory, as this monkey had done for 20 months. Accordingly, the most reasonable conclusion is that the adult resulted from the experimental feeding. That being so, the freedom of the country from indigenous infection is attributed to the love of the inhabitants for running water to drink, the drinking of stagnant water being generally agreed upon (Leiper, 1907, Turkhud, 1915) as the principal factor in the spread of the disease.

C. L.

Pradhan (Y. M.). **Observations on Experiments designed to combat Dracontiasis in an Endemic Area by Col. Morison's Method of 'Liming Wells.'**—*Indian Jl. Med. Res.* 1930. Oct. Vol. 18. No. 2. pp. 443–465. With 4 graphs & 1 plate.

In the Colaba District of Bombay 10 per cent. of the population suffers yearly from guineaworm infection between February and May. In 23 per cent. of these a joint is affected, generally the ankle, leaving a permanent and crippling condition, so that economic waste is enormous. Cyclops lived for 24 hours in potassium permanganate, 2 ounces in 1,000 gallons of water, and such water is undrinkable. Lime (80 per cent. CaO) in a strength of 1 drachm to the gallon was used by removing water from the well concerned and returning it with the requisite amount of lime dissolved in it. The water was potable in 2 days. The process had to be repeated every fortnight as cyclops appear again after that period. In two villages with wells so treated in 1929 the number of infections were 63 and 33 in 1928,

and 26 and 26 respectively in 1929. In two control villages the figures for 1928 were 12 and 24, and for 1929 15 and 26. "Since guineaworm disease is seasonal, liming operations need only be done from February to the end of May to prevent contamination of water by acute cases, so that it would be very economical."

C. L.

Mirza (M. B.). Beiträge zur Kenntnis des Baues von *Dracunculus medinensis* Velsch. [**Structure of** *D. medinensis*.]—*Ztschr. f. Parasitenk.* 1929. Oct. 12. Vol. 2. No. 2. pp. 129–156. With 33 text figs. [35 refs.] [Zool. Inst., Univ., Frankfurt a.M.]

Worms were recovered by the time-honoured custom of twisting them round a stick, extraction taking a fortnight. In a few cases it was nevertheless held that a satisfactory reconstruction could be made, if the worms were then preserved in Petrunkewitsch's fluid, namely distilled water 90, absolute alcohol 60, glacial acetic acid 27, nitric acid 3, and perchloride of mercury to saturation.

The examinations confirmed the presence at the anterior end of the worm of 6 papillae in the usual positions and a dorsal and ventral one also. The reconstruction has a remarkable resemblance to the well-known figure consistently copied from Leuckart, and the axial uterus with its now functionless terminal ovarian tubes is re-described. The tripartile muscular oesophagus, typical of myosyringata, is marked in its anterior end, but more posteriorly the three oesophageal glands, particularly the dorsal one, take massive proportions; and the considerable cavity of the dorsal gland opens anteriorly by its duct into the oesophageal lumen. Posteriorly the oesophageal lumen with its cuticular lining was in these extracted worms sometimes lost, sometimes present beside or within the glandular structure.

C. L.

Makel (H. P.) & de Vault (V. T.). **Dracontiasis—Case Report.**—*Milit. Surgeon.* 1930. Nov. Vol. 67. No. 5. pp. 600–604. [3 refs.]

A "Hindu" who had left India 4 months was admitted to Colon Hospital, Panama, with a supra-pubic superficial inflammatory mass from which, on incision, were removed two thread-like structures each 7 cm. long. "Attempts to determine the internal structure of the filaments both in the gross and the microscopic, were unsuccessful." The tissues showed giant cells, fibroblasts with sclerosis, occasionally leucocytes and eosinophils. [In the circumstances the certainty suggested by the title is a pity.]

C. L.

Chaigneau (Y.). Quelques considérations sur la formule leucocytaire et le traitement par le kermès des tirailleurs atteints de dracunculose. [**Leucocyte Formula and Treatment by Kermes of Guineaworm among Tirailleurs.**]—*Ann. de Méd. et de Pharm. Colon.* 1930. Jan.-Feb.-Mar. Vol. 28. No. 1. pp. 81–85. [5 refs.]

Kermès is a tersulphide of antimony; it was given in doses of 0·4 gm. daily, drunk in water, and was held to expedite delivery in all but one of eight worms. The percentage of lymphocytes and medium mononuclears ["moyen monos"] lay between from 42 and 48.

C. L.

Penso (Giuseppe). Osservazioni ed esperienze sull' "Anguillula aceti." [**Case of *Anguillula aceti* Infestation.**]—*Ann. di Med. Nav. e Colon.* 1930. Mar.-Apr. Year 36. Vol. 1. No. 3/4. pp. 167–177. With 13 figs. on 2 plates. [28 refs.] [Inst. of Med. Parasit., Univ., Rome.]

A child of 6 was suspected of threadworms. The result of an enema of acetic acid and water disclosed *Anguillula aceti* which is described and pictured and the literature reviewed.

C. L.

Nieschulz (Otto) & Hofkamp (H. St.). Ueber den Wert der sog. D.-C.-F.-Methoden von Lane als Anreicherungsverfahren für Nematodeneier und Kokzidienzysten. [**The Value of Lane's D.C.F. Method for Nematode Eggs and Coccidial Cysts.**]—*Deut. Tierärzt. Woch.* 1930. Feb. 22. Vol. 38. No. 8. pp. 116–117. With 1 text fig. [6 refs.] [Inst. for Infectious Diseases & Parasit., Utrecht.]

The authors comment on the lack of mention of D.C.F. in veterinary literature. Nieschulz has used it as a routine means of parasitological investigation of faeces for a year, at the State Veterinary Institute at Buitenzorg, Java, and at Utrecht. The method used is described as a modification of Lane's, whose purpose was mass diagnosis for which a special centrifuge was devised. The authors describe a small bucket usable with the ordinary medical centrifuge with 0·5 cc. of stool. Speaking evidently of dog's faeces they report that eggs and coccidial cysts are very quickly and easily found, so that a negative diagnosis can be made in at most 2 minutes. They describe the method as simple, absolutely certain, needing no costly apparatus, and quickly and cheaply carried out It is summed up as a method which is strongly recommended to all veterinarians. The exact comparisons of D.C.F. with other methods, on which these opinions are largely based, are being published by Hofkamp.

[In papers dealing with mass diagnosis stress was naturally laid on a suitable heavy instrument, but the writers have overlooked Fig. 3, *Trans. Roy. Soc. Trop. Med. & Hyg.* (1924), Vol. 17, and the comment on p. 410 that the short bucket there described "makes the technique cheaply available for use in any centrifuge provided the D-aperture in its head be roomy enough to take the horns and cover and provided 0·5 cc. of stool be used."]

C. L.

Caldwell (Fred C.), Caldwell (Elfreda L.) & Davis (Gordon E.). **Some Aspects of the Epidemiology of Infestation with Trichuris and Ascaris as revealed in a Study at the Hospitals for the Insane and the Home for Mentally Defective Children in the State of Alabama.**—*Amer. Jl. Hyg.* 1930. May. Vol. 11. No. 3. pp. 619–651. With 5 text figs. [20 refs.] [Field Research Lab., Internat. Health Division, Rockefeller Foundation, Andalusia, Alabama.]

Determination of infection was by "the salt flotation method" [whether direct or indirect, gravity or centrifugal, with their varying degrees of accuracy, is unstated]. Counting was by the Caldwell's method on stools conveyed to a central laboratory and there kept on

ice till examined. Comparison of the amount of infection with the period of residence showed that infections with ankylostomes, ascaris and trichuris, particularly the last two, were all being acquired in the institutions concerned. Patients were mainly warded with those of like behaviour, and it was in wards of patients with dirty habits that the amount of infection was greatest with ascaris and trichuris. Moreover infection was evidently acquired in the apparently clean ward yards where as many as 5,000 eggs of ascaris and trichuris were isolated from 100 gm. of soil. Age, sex, colour, and kind of mental disease had in themselves no importance in determining acquisition of infection. Ascaris was far less frequent than trichuris infection and, the mode of infection being held identical, the fact is not considered as explicable by any one proved factor.

C. L.

Torres (C. Magarinos) & Villela (E. Libanio). [In Portuguese & French.] Nematodios immaturos, parasitos erraticos e desgarrados encontrados nos tecidos do homem. Némathelminthes parasites erratiques et egarés trouvés dans les tissus de l'homme à Rio de Janeiro (Brésil). [**Erratic Nematodes found in Human Tissues at Rio de Janeiro.**]—*Mem. Inst. Oswaldo Cruz.* 1929. Vol. 22. In Portuguese pp. 161–167. With 8 plates. In French pp. 168–174. [3 refs.]

Four cases are described. 1. An Agamofilaria coiled up onchocerca-wise so as to form a yellowish subperitoneal nodule 1 cm. by 1·5 cm. at the outer border of the left kidney. On section the nodule emitted a purulent fluid and contained a nematode cut a score of times. 2. Two fibrous nodules in the epididymis, the smaller containing in a central cavity a larval nematode. 3. What is taken to be a larval nematode which was found in the endometrium surrounded by eosinophils. 4. Inflammatory nodules in the liver believed to surround eggs of a helminth.

C. L.

Wülker (G.). Die Entstehung des Parasitismus bei den Nematoden. [**The Origin of Parasitism in the Nematodes.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 188–200 (272–284). With 3 text figs. [21 refs.]

A general survey of parasitism and discussion as to its means of establishment.

C. L.

Matossi (R.). Die Verbreitung der Askariden in Zürich und Umgebung. (Beitrag zur Askaridenenquete in der Schweiz.). [**Ascariasis in Zurich and its Suburbs.**]—*Schweiz. Med. Woch.* 1930. Oct. 4. No. 40. pp. 941–942. [5 refs.] [Children's Clinic, Univ., Zurich.]

The stools of 1,000 children between 6 and 10 were examined, by the Galli-Valerio method, *i.e.* by the use of a properly diluted faecal suspension in 2 per cent. commercial formalin. The suburbs showed an infection percentage of 48, the country 39, and the town itself 28.

Infection increased with age of the child. The greater prevalence in recent years is attributed to the growing habit of eating raw food [vegetables ?].

C. L.

BLACKIE (William K.). **Histological Observations on Experimental Ascariasis.**—*Jl. Helminthology.* 1930. June. Vol. 8. No. 2. pp. 93–102. With 3 text figs. [School of Hyg. & Trop. Med., London.]

These observations refer to lesions caused in liver, lungs and kidneys by larvae of *Ascaris megalocephala* during their migrations in rabbits, guineapigs, and mice, there being no essential difference in the effects caused in these 3 hosts. The animals died or were killed 3 to 7 days after an infective feed of many thousands of embryonated eggs. In the *lungs* intra-alveolar haemorrhage is the essential lesion, with large mononuclears actively phagocytic of red corpuscles and nearly always containing a finely granular, dark brown, iron-containing pigment. There are also cell clusters containing eosinophil, small round, and larger cells often surrounding a haemorrhage which sometimes contains a larva. Larvae may be found in alveoli where they seem to be undergoing dissolution, or in their walls. In the *liver* parenchyma degeneration is general but is most marked round the intralobular vein. It varies from cloudy swelling to necrosis ; and in an animal dying of infection no cell may be normal, so that hepatic insufficiency must contribute largely to death. There are cell clusters, too, mainly at the periphery of the lobules, eosinophils comprising about three-quarters of the cells but being also scattered through the liver and predominating in its blood vessels. These foci are rarely in relation to a larva. In the *kidneys* no larvae were found. The glomeruli are congested. Between these and the loop of Henle there is moderate cloudy swelling. From the loop of Henle to the end of the junctional tubule the cells are extensively necrosed, with their lumina containing debris or casts. The kidney being remote from the migratory route these changes must be toxic, and their extent contributory to death. " More conclusive evidence of the presence of a larval toxin is to be found in the demonstration of immune body in the serum of rabbits during the stage of larval migration."

C. L.

EMERY (Frederick E.) & HERRICK (Chester A.). **The Effects of Ascaris Extract on Circulation and Respiration.**—*Amer. Jl. Physiol.* 1929. Dec. 1. Vol. 91. No. 1. pp. 143–149. With 4 text figs. [15 refs.] [Depts. of Physiol. & Zool., Univ. of Wisconsin, Madison.]

" Changes in circulation and respiration produced by extracts of the pig ascaris have been studied on etherized dogs and cats under chloralose anesthesia.

" The ascaris extract has a strong depressor effect on blood pressure. The heart rate is not appreciably altered.

" The respirations were somewhat deeper with little or no change in rate.

" Plethysmograph records show that the volume of the spleen, liver and of the intestine fell with the blood pressure. The volume of the leg increased.

" The ascaris extract produced irritation to the skin and respiratory passages in man.

" The histamine like properties of the extract are discussed."

C. L.

ISHIKAWA (S.). **On the Fate of the Ova of the Ascaris in Heaped Manure mixed with Human Faeces, and the Investigation of the Eggs adhering to Vegetables.**—*Jl. Oriental Med.* 1929. Oct. Vol. 11. No. 4. pp. 127–131.

" Heaped manure " in Manchuria means human or pig and sometimes other faeces collected round houses when more or less dry, softened with water, mixed well with " dirt," and made into bricks which after drying for about 5 days are stacked till used. Nevertheless the inner part of a brick retains moisture and viable ascaris eggs were obtained from it even after exposure to summer heat and severe winter cold. Vegetables manured with this fertilizer carried ascaris eggs. Pickled vegetables carried fewer than fresh ones, but whether the eggs were viable or not was not ascertained.

C. L.

FISHBACK (Hamilton R.). **Experiments with Certain Reactive Factors of Ascaris.**—*Jl. Infect. Dis.* 1930. Oct. Vol. 47. No. 4. pp. 345–354. With 1 text fig. [21 refs.] [Med. School, Northwestern Univ., Chicago.]

In this paper Fishback points out that anaemia is a common accompaniment of ascaris infections of human beings, and that the haemolytic action of the worms and their products has been much studied. Evidences of allergic activity resulting from ascaris infestations are also cited. Three antigens derived from dry powdered ascaris substance were used in various experiments, namely, a saline extract, a methyl alcohol extract and an acetone-insoluble alcohol-soluble extract. No distinction was drawn between *Ascaris lumbricoides* and *Ascaris suilla* as a source of antigen. The haemolytic effects of these extracts on human red blood corpuscles, their oxytocic action on the sensitized guineapig uterus, their capacity to induce skin reactions and the modifying effects of immune sera on these three types of activity were all investigated.

All the extracts possessed a strong but variable haemolytic action on human red blood corpuscles, and small doses of serum derived from rabbits immunized with ascaris substance completely inhibited haemolysis.

Uterine strips from sensitized guineapigs responded specifically to ascaris extracts, but after incubation with immune serum the acetone-insoluble, alcohol-soluble extract caused no uterine contraction though the saline extract remained active. This residual exciting factor was considered to be related to its protein content. In an allergic human subject the results of intradermal tests with ascaris extracts were positive, and here also the reactivity of the acetone-insoluble, alcohol-soluble extract was neutralized by immune serum though not the saline extract. The immune content of the serum was thus specific for ascaris haemolysin and for the oxytocic and skin reactive factors contained in the acetone-insoluble alcohol-soluble ascaris extract, but was ineffective against the saline extract.

N. Hamilton Fairley.

Schmelewa (A. A.). Der Einfluss der Wasserstoffionenkonzentration des Mediums auf die Entwicklung der Askarideneier. [**Influence of pH of Medium on Development of Ascaris Eggs.**]—*Rev. Microbiol., Epidémiol. et Parasit.* 1929. Vol. 8. No. 3. pp. 319–324. With 3 text figs. [18 refs.] [In Russian. German summary pp. 360–361.]

No effect on development of ascaris eggs was noted in solutions varying in pH from 3 to 8, although the albuminous coat of *A. lumbricoides*, including *A. suilla*, was dissolved when this exceeded 5 and that of *Parascaris equorum* after 24 hours in solution of any acidity.

C. L.

Moretti (Giulio). Osservazioni sul tragitto degli ascaridi attraverso la parete intestinale dell'uomo. [**Passage of Ascarids through the Intestinal Wall of Man.**]—*Pathologica.* 1930. Apr. 15. Vol. 22. No. 462. pp. 188–195. With 4 figs. on 1 plate. [38 refs.]

In a purulent peritonitis with an ascaris free in the abdominal cavity, there was found 3 cm. above the ileocaecal valve a perforation 2 mm. across, in the production of which mechanical and chemical action by the worm are considered as active agents. Seven other worms were found in the alimentary canal.

C. L.

Dufosse. Perforation intestinale revélée par l'issue d'un ascaris. [**Intestinal Perforation disclosed by Egress of Ascaris.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1930. Jan. Vol. 8. No. 1. p. 89.

In a woman whose husband had put a knife blade 6 cm. long into her abdomen, two intestinal wounds were found and sutured. Examination of neighbouring coils showed no further injury, but an ascaris was seen and found to be escaping from yet another perforation which was then dealt with. Santonin ten days later expelled two ascaris and she left hospital 15 days after operation.

C. L.

i. Power (R. Wood) & Johnston (H. W.). **A Case of Ruptured Empyema of the Gall-Bladder associated with** *Ascaris lumbricoides*.—*Brit. Med. Jl.* 1930. June 14. pp. 1086–1088. [35 refs.]

ii. Hare (Tom). **Invasion of the Gall-Bladder by** *Ascaris lumbricoides*. [Correspondence.]—*Ibid.* 1930. July 5. p. 42.

i. A ruptured empyema of the gall bladder caused general peritonitis. No ascaris was found in the gall bladder or peritoneum, but 4 were passed per anum. It is held probable that if there had been worms and ova in the gall bladder they would have undergone disintegration in the pus.

ii. Hare points out that two specimens in the museum of the Royal Veterinary College show migration of ascaris in the pig in the bile ducts, hepatic ducts and gall bladder. The last and the pancreatic duct are however but rarely entered in swine.

C. L.

Ceppi (Ernest). L'ascaridiase complication grave d'une opération relativement simple. [**Ascariasis complicating an Operation.**]—*Schweiz. Med. Woch.* 1930. Nov. 8. No. 45. pp. 1054–1055.

A caesarian section was followed by persistent vomiting and the expulsion one by one over a number of days of 17 ascaris by the mouth and three by the anus. There is no note of the giving of an anthelmintic

during this period of prolonged straining which burst open the abdominal wound, fortunately without serious result.

C. L.

LANE (Clayton). **Gauging the Hookworm Load of a Community.**—*Lancet.* 1930. May 3. pp. 978–981. [15 refs.]

In effect the question is asked: Do the customary egg counts, as now carried out before and after a hookworm campaign, really gauge the hookworm load of a community? and the answer given is No. For these reasons. Not only anthelmintics but illness of the host may disturb oviposition. Of two men with the same hookworm load, he passing the smallest stool will appear from egg counts to have more worms than the other: children have small stools and there is no reason to suppose that their hookworms are less fertile than those of adults; they should not be included in such counts. As Looss showed nearly 30 years ago just-mature worms lay few eggs, a fact now confirmed for hookworms of dogs and cats; where then infection is seasonal the same number of worms may produce quite different egg counts at different seasons.

An allowance for stool consistence is now almost invariable, the number of eggs per gram of mushy stools being multiplied by 2, and of liquid stools by 4, and the whole thereby expressed as if all stools were solid. The need to do so is essentially based on counts of 7 stools only, 4 solid, 2 mushy and 1 liquid; only in 3 of them was there re-examination to determine whether all worms had been expelled and in those 3 the technique used could not in fact determine that point. Even in these seven cases then the number of eggs counted did not necessarily come from the number of worms recovered. Moreover there is no agreement among others who have separately investigated the matter as to the allowance necessary for stools of different consistencies. His own experiments show that a liquid stool may have less water than a mushy one, and a mushy stool less water than a solid one, so that there is no relationship between stool consistency and water content. There is then no foundation in fact for treating egg counts by a consistence formula; indeed HERRICK found that to do so in dogs' faeces made his results erratic, and AUGUSTINE and colleagues were led to the impossible conclusion that in Egyptian stools the same faecal material in mushy stools diluted hookworm eggs twice and ascaris eggs three times as compared with formed stools.

Yet again, SARLES has shown for *A. caninum* in the dog that as infections increase in weight each hookworm lays fewer eggs. Lane has analysed work by HILL on 93 persons and showed that when a man harboured an average of 111 female necators, the average daily egg output of each was 4,000, the corresponding figure for 444 worms being 2,500 and for 897 being 1,500. When worms were increased eight-fold, the eggs they laid increased less than three-fold. Egg output does not then run parallel with the number of worms harboured, and egg counts do not really measure the worm load of a community. In inquiring whether ancylostomes lay more eggs than necators it is held, on grounds cited, that many of the conclusions are precarious, but that it will probably prove that they lay about twice as many.

It is added that while for certain investigations accurate egg counts are essential and have in the past been of the greatest value, yet "as usually undertaken with the idea of obtaining the real measure of the worm load of a community, particularly the load before and after

mass treatment, it must be concluded in our present state of knowledge that they are, in spite of their reassuring appearance of accuracy, a waste of time and money."

C. L.

LANE (Clayton). **Behaviour of Infective Hookworm Larvae.**—*Ann. Trop. Med. & Parasit.* 1930. Oct. 22. Vol. 24. No. 3. pp. 411–421. [7 refs.]

This is part of work carried out under grants from the Royal Society. Lane, after quoting PRZIBRAM'S definition of a tropism or taxis, describes observations made on infective hookworm larvae in deep glass cells, in capillary tubes and in films, and the animal's reactions to physical and chemical activation. He finds no evidence of rheotaxis or thermotaxis, but considers that purely mechanical conditions suffice to explain the orientation of passive larvae in gentle currents, and the accumulation of active larvae in angles and at points where heat is applied.

"These observations and this reasoning lead then to the conclusion that there is no adequate evidence for the existence in hookworm larvae of any taxis other than thigmotaxis, the result of actual contact, and that observations which have been held to suggest the contrary are explicable on purely mechanical grounds. They lend little countenance to any departure from what seems to have been Looss's opinion. They may be summarized conveniently if dogmatically by the statement that the behaviour of a larva is not complicated. It comprises automatic movement of a kind which will enable it to reach its normal host; movement which is capable of intensification by disturbance through that host's foot, by the heat of his body and perhaps by his specific body fluids, and of conversion into a thigmotaxis by the resistance to entry offered by that host's skin. Nothing more seems necessary to explain observed larval behaviour, and nothing more to be implicit in it as observed."

C. L.

STILES (C. W.). **Decrease of Hookworm Disease in the United States.**—*Public Health Rep.* 1930. Aug. 1. Vol. 45. No. 31. pp. 1763–1781. [Refs. in footnotes.]

Stiles has collected figures of the incidence of hookworm infection in the southern of the United States, all methods of diagnosis being massed together. The percentage was 33 in 1910–14 and 28·1 in 1929, so that hookworm infection is still widespread. He points out that the questions of soils or of carriers are no new ones in hookworm infection, that the carrier may become a patient, that he is a potential danger to all, and that a light infection may be the "last straw" in illness from other causes. He contrasts the way in which the malaria and hookworm carriers are being viewed by certain hygienists at the present time; for they clearly hold that "known carriers of malaria owe it to the community and to themselves to free themselves from malaria, but known carriers of hookworm are to be eliminated from treatment and to be advised that they do not owe it to the community or to themselves to free themselves from hookworms in spite of the ease of treatment." He deals shrewdly with mathematics in hookworm literature. Regarding the conclusion that 25 hookworms or less are no burden to the host, he says of the figures on which it is based "the conclusion might be drawn that it is better for an Alabama white

school child to have 26 to 100 hookworms than 1 to 25 or none at all." " Many of us ' oldsters ' who look upon symptoms as not beneath our notice, have seen patients improve in health after expelling less than 25 hookworms." Speaking again of this arbitrary mathematical division :

" I am a firm believer in mathematics. For instance, if I drive at the average rate of 25 miles per hour it will take me 4 hours to cover the distance between two towns 100 miles apart by the State highway—that is, *if* there is no variable, such as punctures, blow-outs, lack of gas, oil, or of water, collision, broken springs, detours, friendly debates with State police, etc. But I recognize my automobile as subject to variables . . . and somehow it is very difficult for me to break the habit, contracted in student days, of giving at least some consideration to the great variable in this disease, namely, the human being who harbours the worm." These are his views on mass treatment : " The comparison with livestock, the home of mass treatment, fairly represents my idea on the subject of mass treatment, namely, in a locality where human life is more or less valuable, as in civilized countries, it is only in restricted instances, and under very special precautions that I personally would be willing to assume responsibility for mass treatment ; but in semi-civilized or uncivilized regions, where human life is cheap, where men, women, and children are little above livestock, and where it is a choice of much greater good by means of mass treatment or a much lesser good by individual treatment, I would be governed by a conservative interpretation of the conditions as I saw them."

C. L.

Havens (Leon C.) & Castles (Ruth). **The Evaluation of the Hookworm Problem of Alabama by Counties.**—*Jl. Preventive Med.* 1930. Mar. Vol. 4. No. 2. pp. 109–114. With 2 text figs. [3 refs.] [Labs. of Alabama State Board of Health, Montgomery.]

In Alabama there have been made egg counts of 31,991 persons using the Caldwell's egg counting method, selected because it " is simple, comparatively rapid and readily adaptable for practical use in public health laboratories." Its accuracy is apparently accepted without question. The counties are charted as falling in four grades of infection after using Chandler's " weighted means of the counts of the individuals examined."

C. L.

Schapiro (Louis). **Hookworm Infestation in an Indian (Guaimi) and Non-Indian Population of Panama.**—*Amer. Jl. Trop. Med.* 1930. Sept. Vol. 10. No. 5. pp. 365–373. With 1 fig. [3 refs.]

Guaimi Indians defaecate only in running water ; the non-Indians of Panama defaecate everywhere. The Indians lead an isolated existence except for a period of four months a year when they cultivate and harvest the lands of non-Indians. Judged by Stoll's method the percentage of persons infected is high in both—99·3 in Indians and 95·8 in non-Indians, though [anomalously] average egg counts vary in the opposite direction, namely 3,372 and 11,296 per cc. of faeces. In non-Indians the weight of infection as judged by these counts rose at a constant rate as the haemoglobin index fell, while among Indians it remained fairly constant. Since the incidence of malaria is prac-

tically the same among both races, faulty nutrition is held to be, presumably, the anaemia-controlling factor among the Indians who lead a precarious existence on a deficient diet and are anaemic apart from detected helminthic infection. The facts suggest that the worm burden an individual may carry without showing anaemia varies greatly in different races and in different areas.

C. L.

Benarroch (Elías). La anquilostomiasis y otras parasitosis intestinales en el estado Bolivar. [**Ankylostomiasis and Other Helminth Infestations in Bolivar State (Venezuela).**]—Reprinted from *Bol. Camara de Comercio de Caracas.* 2 pp. [3 refs.] English summary. [Undated, ? 1930.]

Examination was by Willis's direct gravity floatation method in 572 cases. Of these 57 per cent. were positive for hookworm eggs, the different localities giving figures between 40 and 70 per cent. A report of 17 per cent. from 238 examinations made at the Hospital Ruiz on men coming from all over the state is attributed to the use of a less accurate diagnostic method. Ascaris and trichuris eggs were found in 53 and 54 per cent. respectively.

C. L.

Maplestone (P. A.). **Seasonal Variation in Hookworm Infection.** —*Indian Jl. Med. Res.* 1930. Oct. Vol. 18. No. 2. pp. 685–698. With 6 charts in text. [10 refs.] [School of Trop. Med. & Hyg., Calcutta.]

The assumption underlying this paper is that egg counts [the method of counting is not stated] are a reliable measure of the number of worms harboured. In this abstract the facts are separated from that assumption. In a Calcutta central jail 56 persons showed an average count per gram of 1,271 in November, 1927. Those still remaining in the jail were recounted monthly. The average number of eggs fell steadily to 928 in February, rose fairly steadily to 2,222 in May, fell fairly steadily to 1,328 in September, 1928, being still above the figure of 11 months earlier, and fell to 723 next month. It is concluded that there was an increase of infection corresponding to the May rise and that it must have occurred outside the jail walls, presumably in the jail garden. Similarly in two Dooars tea gardens average egg counts on the same persons from June, 1928, to November, 1929, were: June, 1,258; November, 653; March, 526; June, 1,002; November, 577. The counts were highest in June and lowest in November, and the numbers of persons still available fell from 784 to 530. On ten occasions between February, 1929, and February, 1930, a hundred stools were collected promiscuously on each of two tea gardens in Sylhet and eggs were counted. The number of eggs was highest in May or July and lowest in February. It is concluded from a concomitant study of the rainfall that the monsoon rain is the principal factor in limiting the amount of hookworm infection. Maplestone adds "Chandler (1926–28) in his numerous papers on hookworm infection in India has applied corrections to his figures on the assumption that November is the time of maximum infection and April and May about the minimum. It is shown in the present paper that for Bengal and Assam at all events the reverse appears to be the case." He points

out how much more work must be done before such generalizations can be applied, work on rainfall, soil, climate and other matters.

C. L.

Sweet (W. C.). **A Survey of Mysore State for Enlarged Spleens and for Hookworm and Other Helminthic Infections.**—*Mysore Dept. of Health. Bull. No. 7.* Bangalore. 1929. 53 pp. With 2 maps, 1 chart & 11 figs. [9 refs.]

Between July 22nd, 1927, and October 1st, 1928, 11,972 faecal specimens were examined by Stoll's egg counting method, with allowance more elaborate than usual for consistency and, if no eggs were found, by Willis direct gravity floatation. In each of the 8 districts of the State from about 1,000 to about 2,000 persons were dealt with. The average percentage of infection over the whole investigation for each kind of worm, and the average greatest and least percentage infections for each district which this technique detected were as follows: Hookworm 59·4, 85·1, 50·2; ascaris 34·2, 74·4, 7·0; trichuris 14·1, 42·4, 0·5; threadworm 2·6, 4·5, 1·4; *H. nana* 1·0, 0·2, 2·9; trichostrongylus 0·4, 1·7, 0·1; taenia 0·05, 0·2, 0 07, there being none found in 5 States. Judged by Stoll's method the corresponding figures for egg counts per infected person were: Hookworm 1,600, 2,100, 500; ascaris 14,700, 20,800, 4,800; trichuris 1,400, 3,000, 500. There are added corrections for age and sex using as a basis "the age and sex composition of the population of Porto Rico by the 1910 census." Females have more and greater infections with ascaris and trichuris than males; in the case of hookworms there is little to choose; rainfall has no demonstrable effect.

C. L.

i. Robertson (E. A.). **Notes on the Incidence of Hook-Worm Infection of School-Children in the Kuala Lumpur Area.**—*Malayan Med. Jl.* 1929. Dec. Vol. 4. No. 4. pp. 137–138. [2 refs.]

ii. Grey (J. C. P.). **Roundworm and Hookworm Infection among Malay School-Boys—a Survey of the Krian District, with a Note on Mass Treatment in the Schools.**—*Ibid.* pp. 138–141. [10 refs.]

i. Examination by smear of 458 children suspected of harbouring worms showed a percentage of infection with ankylostomes of 12 and with ascaris of 53. But in a routine examination of 220 school children by a modified Willis technique [direct gravity floatation] 61 per cent. were found infected with hookworm, 85 per cent. with ascaris, and 88 per cent. with trichuris. Even so Robertson notes that the method of investigation was very rough.

ii. Using in this case the faecal smear only, it was found that 86·5 per cent. of 684 unselected school children were infected with ascaris and 5·8 per cent. with hookworms, and it is concluded that it can properly be assumed that the figures hold good for the adult population of Krian living under kampong conditions. Oil of eucalyptus and chloroform was tried as a vermituge since it was recommended in "Manson's Tropical Diseases." Because it was found unpleasant and unreliable it was given up in favour of small doses of oil of chenopodium (minims iv for older boys). This was popular and impressive

since many boys passed round worms. The actual anthelmintic value was not tested.

C. L.

PORTER (Annie). **Cockroaches as Vectors of Hookworms on Gold Mines of the Witwatersrand.**—*Jl. Med. Assoc. South Africa.* 1930. Jan. 11. Vol. 4. No. 1. pp. 18–20.

In 221 specimens of *Blatella germanica* no evidence of ingestion of hookworms eggs was obtained but it is questionable how many specimens came from the mine workings and how many from the surface. Of 97 *Periplaneta americana* there were 8 in which " detailed morphological and biometric examination showed that larvae and ova [in their intestinal contents] were those of *Ancylostoma duodenale.*" They came from 4 adjoining mines and when caught had fed naturally. *P. americana* is a strong flier and rapid runner. Experiments with prettily painted *B. germanica* showed that they can travel from point to point for several hundred feet and " leave a trail of hookworm ova en route should they have ingested infected faecal material."

C. L.

CALLERIO (Giovanni). Sulla diffusione dell' anchilostomiasi in Provincia di Pavia. (Osservazioni epidemiologiche, cliniche e terapeutiche.) [**Hookworm in the Province of Pavia.**]—*Boll. Soc. Med.-Chirurg. di Pavia.* 1930. Vol. 44. No. 4. pp. 521–535. [16 refs.]

Hookworm has been known to exist in Pavia for the past 50 years. The numbers of persons examined were small, but figures are given for the years 1925–28 and for 1929–30. During the former of 402 men examined 4 were found infected, and one only of 391 women. During the latter period 10 infections were found among 248 men, and 8 among 227 women. The percentage infection of men has thus increased from 1 to 4·3 and of women from 0·25 to 3·52. A map shows the towns in the province where hookworm has been found according to TIBALDI's records made in 1923 and those of the author in 1929–30.

H. H. S.

COLBY (Charles DeWitt) & SCHAFFLE (Karl). **Tuberculosis and Uncinariasis : an Analysis of Sixty-Eight Cases.**—*Southern Med. Jl.* 1930. Sept. Vol. 23. No. 9. pp. 801–807. With 5 text figs.

The authors recount cases in which tuberculosis was diagnosed but the signs cleared up after hookworm infection was established diagnostically and cured. Diagnosis was by a dilute smear, described as Stitt's technique. Treatment was by " iron sulphate in the dose of 0·320 gm., p.c." It is added without evidence offered as to disinfestation : " Ferric sulphate is efficient as a vermifuge for hookworms, whipworms and roundworms, and is safe and free from discomfort in the treatment of weak and emaciated individuals." [As yet there appear to be no references to sulphate of iron as a vermifuge in man.]

C. L.

GARIN (Ch.), ROUSSET (J.) & GONTHIER (B.). Les fonctions gastriques dans l'ankylostomose. [**Gastric Functions in Ankylostomiasis.**] —*Lyon Méd.* 1930. July 6. Vol. 146. No. 27. pp. 3–9. [3 refs.]

By a modification of Telemann's concentrative technique (this *Bulletin*, Vol. 25, p. 936) the authors counted the eggs collected on an area of 22 by 22 mm., and by an unstated anthelmintic expelled worms. The table of the 57 persons examined shows great anomalies. In one case one worm produced 63 eggs, in another 60 worms produced 30 eggs only, in yet another 56 worms produced 1,858 eggs besides 144 reported as being found in the stomach contents. It is not noted whether attempt was made by this diagnostic method to determine that the anthelmintic had disinfested. It is concluded that neither the number of worms (held to be fixed to the duodenum) nor the anaemia influenced the gastric acidity.

C. L.

HUART (A. J.). **On the Causes of Anaemia in Ankylostomiasis.**—*Acta Leidensia* (*Scholae Med. Tropicae*). 1929. Vol. 4. pp. 48–109. [84 refs.]

From a most valuable critical survey of the apposite literature and from his own experiments, Huart concludes that the anaemia of ankylostomiasis, at least in the dog, is the result of persistent intestinal bleeding. His conclusion rests on the following. The literature shows that blood is present in the worms if these are examined immediately after death, although a few hours later they contain none. Again the anterior part of the worms contains an anticoagulin, which must make for bleeding ; but there is no clear evidence for a haemolytic substance in them. Certainly alcoholic and ethereal extracts of worms may produce haemolysis, but the same effect may be produced by all normal organs living or dead. That a toxin is excreted by the worm and absorbed by the host is made certain by the occurrence of eosinophilia, and by the frequent occurrence of nephritis and chloride retention with oedema in cases of severe ankylostomiasis in man ; but that it causes the anaemia there is no proof.

Huart used dogs 1 to 2 months old each weighing about 3 kg. Each received many larvae of *A. caninum* and *A. braziliense* in a gelatin capsule. In about 10 days an acute fulminating anaemia set in ; in one case it was immediately fatal ; it was not proportional to the number of worms recovered after death ; it was accompanied by no sign of increased haemolysis, by no bilirubin in the serum ; no complement fixation was detected. Onwards from the ninth day after infection spectroscopic examination of the faeces showed much haemochromogen, although the dogs had been for a week on a diet free from meat and chlorophyl. There was often so much haemochromogen as to imply a very considerable loss of blood. Haematoporphyrin was rare. A typical postmortem finding is the following. Before infection red corpuscles were 5,870,000, twenty days after infection 1,930,000. This dog died on the 34th day ; immediate autopsy showed 1,876 full grown ankylostomes, 75 per cent. of them being full of blood ; there was a large amount of coagulated blood in jejunum and ileum, and the mucous membrane was sown with haemorrhagic bites. In four of five cases in which it was examined, the bone marrow of the femoral

shaft consisted of fatty tissue to the extent of only one-quarter to one-third, and had blood-forming tissue richly distributed in this.

C. L.

Fülleborn (F.) & Kikuth (W.). Wie entsteht die Anämie bei Hakenwurminfektion ? [**The Origin of Anaemia in Hookworm Infection.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1929. Vol. 33. No. 3. pp. 171–186 (255–270). With 1 text fig. [22 refs.]

The literature is reviewed and certain experiments recounted. A dog weighing 5·2 kg. was given 17,000 larvae of *A. caninum* on two consecutive days. Within 16 days its haemoglobin fell from 110 to 35 and its weight to 4·9 kg. When killed after that period 1,100 adult but not yet ovipositing worms were found in bloody slime in the intestines whose contents contained iron corresponding to 290 cc. of normal or 455 cc. of the impoverished blood. The bowels had not been opened for 3 days so these figures corresponded to the amount of blood wasted by the worms over about that period. In addition the spleen and marrow contained much pigment [so that, taking also into account the nourishment actually used by the worms, the blood destruction was probably considerably greater] though the liver did not show an iron-containing pigment except in a dog which had distemper and had also been treated with phenylhydrazine. The convoluted tubes of the kidneys had their epithelium greatly degenerated and desquamating. It is noted that this loss of blood is not necessarily a measure of what occurs in chronic infections. On keeping worms from this dog in Ringer's solution at 37° C. for about 2 days the fluid did not invariably haemolyse.

Extracts of dried hookworms were injected into mice (as much as represented 300 worms per mouse) without harming them ; but when live adult but not ovipositing worms were injected it was quite otherwise. The worms were washed for 5 minutes in 1 in 500 chinosol solution, then passed into a 1 in 20,000 solution and injected under the skin of mice. There some lived for as long as 12 days, the limit tested, and were very lively even then, though there was no egg production. They produced considerable haemorrhages, estimated as being as much as 0·2 cc., and wandered into the peritoneal cavity and even entered the gut ; with this, haemoglobin fell greatly, to even as low as 7 per cent., and the spleen was apt to be much enlarged. The experiments are considered undecisive as to the factor producing hookworm anaemia.

C. L.

i. Doubrow (S.) & Rousset (J.). Sur un procédé de technique histologique concernant la coupe en série des petits nématodes. [**Technique of Serial Sectioning of Small Nematodes.**]—*Bull. d'Histologie.* 1929. Vol. 6. p. 416. [Labs. of Histol. & Parasitol., Faculty of Med., Lyons.]

ii. —— & ——. Etude cytologique du contenu intestinal de l'*Ankylostoma duodénale.* [**Cytological Study of Gut Contents of** *A. duodenale.*]—*C.R. Soc. Biol.* 1930. Mar. 14. Vol. 103. No. 10. p. 786. [1 ref.]

i. The authors point out the difficulties in obtaining satisfactory sections of small nematodes even when embedded in celloidin and have

devised and recommend the following technique, with its appeal to the epicure and helminthologist, as giving serial sections 4μ thick even in these most difficult subjects.

The worms are fixed for 4 to 12 hours in a modified Schaudinn's solution, namely a saturated solution of perchloride of mercury in 80 per cent. alcohol with the addition of 5 per cent. glacial acetic acid. They are transferred to 80 per cent. alcohol tinted with a few drops of iodine to the colour of a good madeira wine where they are left for a week on the average, but for longer without damage if desired. After several baths in 90 per cent. alcohol (absolute alcohol is not indispensable) they are left for 24 hours in butyl alcohol, and again for 24 hours in an incubator at 56° C. in butyl alcohol saturated with paraffin. Next follow one or, better, two baths in pure paraffin each lasting 24 hours, after which the usual procedure allows of serial sections being fastened on slides and stained.

ii. Using this technique the authors found that in the proximal parts of the alimentary canal of hookworms there was found an eosinophil residue with some few red corpuscles still identifiable, white corpuscles were recognized by their nuclei, but nothing was found which could be identified as epithelial cells of the small intestine. Further caudally, the intestinal contents lessen. In the anterior part there were collections of yellow pigment which did not show the reaction of Perls [Prussian blue reaction].

C. L.

Fülleborn (F.). Was ist Ground-itch? Ein kritisches Sammelreferat. [**What is Ground Itch?**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Mar. Vol. 34. No. 3. pp. 133–158. With 5 text figs. [3 pages of refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

The literature of ground itch is reviewed, the condition being described as reddening followed by vesiculation and later by pustulation of the skin commonly interpreted as associated with penetration by hookworm larvae. In geographical distribution it is limited to Assam, Bengal, the mulberry plantations of China, the islands and shores of the Caribbean Sea including the southern United States, and perhaps the Amazon region, with no report of its presence from many hookworm countries, including Egypt, or from many hookworm infected mines, nor does Fülleborn believe that there is satisfactory evidence to connect it with intense infection. He points out that a vesicular eruption was not obtained by Looss in his classical experiments, and that the theory of their cause by a secondary infection due to scratching of the irritable point of larval entry is untenable since scratching occurs in all lands, but ground itch in certain of them only; while this last objection is equally against its being an anaphylactic effect. Dermatomycosis, cercarial dermatitis, and the bites of ticks and mites all may produce a vesicular dermatitis, which however especially occurs on plantations in which the pickers stand long on muddy ground, that is to say in conditions in which the epithelium of the feet is sodden and lifted, just as that of the hands of washerwomen. It is then looked upon as an occupational disease and it is suggested that the ambiguous terms ground itch and mazamorra should be replaced by the hindustani term originally used by Elliott in 1900, namely panighao [which means "water sore" (as indeed Elliott alternatively named the condition in the title of the paper in which he originally described the condition in 1900), and which seems

to differ too little in ambiguity from ground itch to necessitate or justify any change 30 years later, particularly into a language so few readers understand.]

C. L.

KITAMURA (K.). **Experimental Studies on Dermatitis caused by Hookworm Larvae.**—*Japanese Jl. Dermat. & Urol.* 1930. Apr. Vol. 30. No. 4. pp. 279–317. With 12 text figs. [114 refs.] [In Japanese. English summary pp. 37–39.] [Dermat. Clinic, Imperial Univ., Tokyo.]

The positions in which a histological examination found larvae are enumerated in the English summary. Regarding the clinical condition caused on the skin, it began in dogs with erythema, and was followed by swelling, bullae, pustules, erosion and ulcer with spontaneous recovery [indeed typical ground itch]; at the same time, even before there was clinical erythema, sections showed congested blood vessels with eosinophil cells and, subsequently, exudation of leucocytes including eosinophils into the surrounding parts—perivascular, perifollicular, intrafollicular and into the subcutaneous tissue, and masses of cast sheaths on the surface at times.

C. L.

FÜLLEBORN (F.). Können Larven von *Ancylostoma duodenale* oder *Necator americanus* "Creeping Eruption" verursachen? [**Can Larvae of** *A. duodenale* **or** *N. americanus* **cause Creeping Eruption?**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Apr. Vol. 34. No. 4. pp. 220–223. [12 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Fülleborn concludes that larvae of *A. duodenale* and *N. americanus* do not cause creeping eruption in man, but holds that the condition which Looss described on his own person was clearly not creeping eruption in the sense of RILLE, caused by a larva of some kind, but was a wandering wheal, such as the supersensitization of skin caused by strongyloides larvae.

C. L.

ELLENBOGEN (Victor). Experimenteller Beitrag zur Frage der durch die Larven von *Ankylostoma caninum* beim Menschen verursachten Hauterscheinungen. [**Skin Changes produced in Man by Larvae of** *A. caninum*.]—*Klin. Woch.* 1930. Aug. 23. Vol. 9. No. 34. pp. 1583–1585. With 1 text fig. [9 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Infective larvae in Ellenbogen's experiments did not penetrate the undamaged skin of the persons on whom the experiments were tried. In seven instances in which they penetrated damaged skin a slightly itching nodule followed in one. No creeping eruption appeared.

C. L.

Marques (Arnaldo). Da symptomatologia da ancylostomiase. (Estudo clinico de dois signaes buccaes pouco conhecidos.) [**Symptoms of Ankylostomiasis.**]—*Brasil-Medico.* 1930. Feb. 15. Vol. 44. No. 7. pp. 190–192. [10 refs.]

Marques believes that the precision of microscopic diagnosis has diverted attention from clinical examination. He holds that there are two signs diagnostic of hookworm infection, "sheep's tongue" and "rodent's teeth." The latter have the colour of those of the agouti and their wearing down, which is most obvious in the lower incisors, is attributed partly to grinding of the teeth in restless sleep and partly to earth eating. The "sheeps tongue" is a condition of patchy slate-coloured pigmentation not actually limited to the tongue but found on the gums, the mucosa of the cheeks, and on the skin. It is believed that it must be correlated with the accompanying weakness and low blood pressure as being an Addisonian complex, which calls for investigation of the state of the suprarenals in hookworm infection. It is noted as being found only in chronic cases, principally those with a verminous cachexia. [In 1902 Delamere wrote to Manson (*Jl. Trop. Med.*, Vol. 5, p. 183) describing spots looking "exactly as if the patient had *just* wiped a penful of Stephens' blue-black ink on his tongue." He found that under treatment with thymol, iron and quinine the small marks disappeared in from 10 to 20 days, the larger ones taking 6 weeks or more. Duprey (l.c. p. 267) had frequently noted these markings but only in immigrant Indians who have the habit of eating *pan*. Sandwith (*Ibid.* 1904, Vol. 7, p. 247) reported examining in Cairo 100 patients with ova found in their stools and 100 without, found 11 cases of pigmentation in the first and 7 in the second, and held that the pigment marks were of no value for diagnostic purposes. The matter has since been almost completely dropped. The precision of microscopic diagnosis to which Marques refers gives him a means of settling the matter.]

C. L.

Keukenschrijver (N. C. Romer). Afdrijven van mijnwormen met behulp van de duodenaalsonde. [**Expulsion of Hookworms by Means of the Duodenal Tube.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1930. Oct. 1. Vol. 70. No. 10. pp. 1000–1001.

Since the duodenal sound has been used for the treatment of tapeworm infection, it was here tried for hookworms, 1·2 cc. or 1·5 cc. of oil of chenopodium [ascaridole content unstated] being given, followed by Epsom salts, to 200 Javanese. Later 1·5 cc. of carbon tetrachloride was administered and the number of worms recovered by each treatment noted. In many cases of anaemia no worms at all were recovered [the grounds on which they were selected for treatment are unstated] but 20 are listed. In three given 1·2 cc. of oil of chenopodium the percentage of the total worm recovery by that treatment varied from 40 to 100, and with a dose of 1·5 cc. from 0 to 100. The microscope is not mentioned as having been used in the attempt to establish disinfestation, nor is the efficacy of the drug when given by sound compared with an administration by mouth in otherwise like conditions.

C. L.

MIYAGAWA (Yoneji) & OKADA (Ryoichi). **Biological Significance of the Lung Journey of Anchylostoma Larvae in the Normal Host. First Report.**—*Japan Med. World.* 1930. Mar. 15. Vol. 10. No. 3. pp. 43–55. [Government Inst. for Infectious Diseases, Imperial Univ., Tokyo.]

The hookworms used were *A. caninum*. First there is confirmation of observations that the amount of infection induced when infective larvae are given by the oral route to the normal host lessens with the age of the host. Next pups were infected through the skin and from them larvae were collected (1) from the lung, (2) from the trachea, and (3) from the intestine, and were fed to other pups. The percentages of young worms recovered from these second animals were respectively 75, 90·3 and 93. But if the first animals were abnormal hosts—rabbits or guineapigs—and larvae were taken from the trachea and fed to pups, the percentage of worms found in the pups was 51 to 58·5. [Although there is some difficulty in understanding the text, comparison with tables and cross headings leave no reasonable doubt that the above accurately describes the results obtained.] During the passage through the lung of normal hosts the hookworms undergo changes which progressively fit them for growth in the intestine; during the passage through abnormal hosts this is far less so. Moreover, if migrating larvae taken from the lung of an abnormal host (rabbit) were fed to another abnormal host (guineapig), most were then found in the lungs of the latter but no development had taken place. If however the first animal were a normal host (pup), then migrating larvae taken from its lung or trachea and fed to an abnormal host did develop and migrate in the latter to an extent depending on circumstances. Of larvae taken from the pup's trachea 24 hours after infection and fed to guineapigs about half reached their lungs, of those taken from the small intestine 24 hours after infection few reached the lungs, while of those taken from the small intestine 48 hours afrer infection none reached the lungs; they remained largely or wholly in the intestine. Moreover these worms developed, in guineapigs to the 4th ecdysis, in rabbits almost to maturity. So that the biological change which takes place in the lungs "is indispensable for the completion of their future development."

C. L.

McCOY (O. R.). **The Influence of Temperature, Hydrogen-Ion Concentration, and Oxygen Tension on the Development of the Eggs and Larvae of the Dog Hookworm,** *Ancylostoma caninum*.—*Amer. Jl. Hyg.* 1930. Mar. Vol. 11. No. 2. pp. 413–448. With 4 text figs. [15 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore.]

Dr. McCoy has cleared up by letter certain points in one of his techniques which had not been entirely understood, and full advantage of his courtesy has been taken in this abstract. The temperature, hydrogen ion concentration and oxygen tension were studied.

Temperature.—At the bottom of a 250 cc. Erlenmeyer flask is a layer of 20 cc. of ordinary solidified bacteriological agar. To this is added 1 cc. of a suspension of bacteria and, after 24 hours incubation of the flask, 1 cc. of a suspension of hookworm eggs [this *Bulletin*, Vol. 27, p. 426]. This amount of liquid forms a layer about 1 mm. thick on the surface of the agar, and it becomes rather viscous from

bacterial growth during incubation. Thirty such cultures were used in each experiment and about 10,000 eggs introduced into each flask; the humidity of the air was at least 85. At certain intervals two flasks were removed, 30 to 80 cc. of warm water added to each and the flasks sufficiently shaken to wash the larvae from the agar into the suspension. Two $\frac{1}{2}$ cc. samples of this suspension were withdrawn and counted. The results were as follows:—

"Thirty-seven degrees centigrade and 15° C. were the highest and lowest temperatures at which the larvae reached the infective stage in agar cultures with bacteria for food. Eggs hatched at 40° and 12° C., but the larvae did not complete their development. At 42° C. the eggs started to develop but did not hatch. The larvae developed most rapidly at 37° C., reaching the infective stage in 48 hours. At 30° C. they matured in 50 to 60 hours, while at 23° C. 4 to 5 days were required. Judging by the per cent. of the larvae which became infective and the final size that they attained, 23° and 30° were the most favourable temperatures tested. Under the conditions of the experiment, the latter may be considered as the optimum. The per cent. of the larvae which matured and their final size was much less at 37°, 17°, and 15° C. than at 23° and 30° C."

Hydrogen ion concentration.—For hatching of eggs these were incubated at 23° C. for 48 hours in 20 cc. of buffer solution. For growth of larvae 20 cc. of a suspension of *Bact. coli* or *B. lactis aerogenes* (to supply food for the larvae) in buffer solutions of the same size were incubated with sterile eggs. Considerable difficulty was found in obtaining buffer solutions which would not kill bacteria or larvae; those used were potassium acid phthalate for acid, a mixture of mono-basic and di-basic sodium phosphate for neutral, and a mixture of sodium bicarbonate and acid sodium carbonate for neutral. The pH range suitable for development was about the same for eggs and larvae.

"Acidities as great as pH 4·6 are not in themselves capable of inhibiting the growth of hookworm larvae. In fact a few larvae developed at acidities down to pH 4·0. The failure of larvae to develop in unmodified feces which showed acid reactions within this range must, therefore, be attributed to some other agent or condition, possibly associated with acidity. Alkalinities up to pH 10·0, also, did not inhibit the development of the larvae. Above this pH, the few larvae which hatched died without growing. The pH range in which larvae became infective is thus 4·0 to 10·0. The percentage of larvae which develop, however, is smaller at the extremes of this range. The size of the infective larvae reared in the more acid cultures was smaller than normal, but in the alkaline cultures the size attained by the larvae was not affected. There were no significant differences in the suitability of the cultures which ranged from pH 6·0 to 9·4."

Oxygen requirements.—Eggs in boiled water (boiled to drive off oxygen) in vials set in vessels containing pyrogallic acid and caustic soda underwent no development. Oxygen is then necessary for this. Regarding sterile eggs in 1 in 2,500 formalin solution, which killed larvae as soon as they hatched, each on the average used 0·0000028 cc. of oxygen up to the period of hatching. The solution at 23° C. contained 6 cc. of oxygen per litre and 250 cc. of it was used in an Erlenmeyer flask of that capacity. It was found that with as little oxygen as 0·4 cc. per litre all eggs hatched provided there were relatively few of them, but when the numbers were so increased that, as above estimated, there was insufficient oxygen for more than half to develop as far as hatching, then only 11 to 24 per cent. did actually hatch in these experiments. As regards excessive oxygen tension, obtained by pressure, more than 15 cc. per litre proved harmful and 30 cc. per

litre inhibited development altogether. Infective larvae lived as long as 4 but not as long as 12 days in the anaerobic tubes mentioned. When kept in sterile conditions (1 in 2,500 formalin solution) to ensure that bacteria should not be present and consume oxygen, the consumption of this gas by the larvae increased with the temperature, that is with larval activity, from 0·00000169 cc. in 24 hours at 17° C. to 0·00001958 at 42° C. or about 9 per cent. for each degree centigrade.

C. L.

Oiso (Tomoaki). Experimentelle Untersuchungen ueber Infektion mit *Ankylostoma braziliense*. [**Experimental Infection with** *Ancylostoma braziliense.*]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1930. June. No. 303. [In Japanese. German summary pp. 28–32.]

In seven persons infection with *A. braziliense* was deliberately induced—in 4 cases by mouth and in 3 by the skin—150 to 600 infective larvae being used in each case. It is stated that thymol, naphthalin [? betanaphthol], "nematol," and carbon tetrachloride proved good anthelmintics, so presumably different anthelmintics were used in different cases. The worms recovered by them had varying relations to the number of larvae concerned. In skin infections they were 4·8, 6·8, and 9·16, and in oral infections 14·6, 21, 43·33 and 74 per cent.; the actual numbers varied between 24 and 142. Evidence for disinfestation is unnoted in the summary. In all cases a definite illness with anaemia and gastro-intestinal disturbances was established as the result of infection. The blood picture is described in detail.

C. L.

Villela (Gilberto G.) & Teixeira (J. de Castro). [In Portuguese & English.] Proteinas do plasma na ankylostomose. **Plasma Proteins in Hookworm Disease.**—*Mem. Inst. Oswaldo Cruz.* 1930. Vol. 23. No. 1. In Portuguese pp. 41–49. [11 refs.] In English pp. 50–58. [11 refs.]

Twenty cases of severe ankylostomiasis were investigated. It was concluded that the total proteins in plasma were lessened, this being due to decrease in albumin, globulin being slightly and fibrinogen generally increased, and non-protein nitrogen being within normal limits. This leads the writers to class helminthic anaemia as a "nephrosis."

C. L.

Stumberg (John E.). **Precipitin and Complement-Fixation Tests on Dog Sera with Antigen from the Dog Hookworm,** *Ancylostoma caninum.*—*Amer. Jl. Hyg.* 1930. Nov. Vol. 12. No. 3. pp. 657–668. With 4 graphs in text. [10 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore.]

"Dried filariform larvae and adults of the dog hookworm, *Ancylostoma caninum*, extracted with acid and alkaline saline solutions, were found to be highly antigenic when injected intravenously into rabbits; alkaline saline extracts were preferable to acid. . . . Dogs parenterally injected with larval and adult antigens failed to show any precipitins in the sera or any complement fixation in excess of the non-specific level. Dogs experimentally infested with hookworms, either by a single infection or after several infections, failed to show anti-bodies in their sera up to seven weeks after infestation."

C. L.

Scott (J. Allen). **The Biology of Hookworms in their Hosts.**—*Quarterly Rev Biol.* 1930. Mar. Vol. 5. No. 1. pp. 79–97. [42 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore.]

A critical survey of matter which has already been abstracted in this *Bulletin*, and the putting of a number of questions which still require elucidation.

C. L.

Campos (F. M.) & Campos (P. Souza). Metabolismo basal na ancylostomose.—**Basal Metabolism in Uncinariasis.**—*Rev. Biol. e Hyg.* S. Paulo. 1929. Vol. 2. No. 1. pp. 69–72. English summary. [8 refs.] [Physiol. Dept., Faculty of Med., S. Paulo.]

"1. The basal metabolism of 24 hookworm infected individuals, determined in accordance to the Benedict-Roth method, oscillated between −31 to + 57 per cent.

"2. The cases of increase were observed most frequently in individuals, suspected of a recent infection."

C. L.

Abdulla (M.). Nervous Symptoms apparently due to a Heavy Ascaris Infection.—*Indian Med. Gaz.* 1930. Apr. Vol. 65. No. 4. pp. 207–208.

Archer (G. T. L.). Note on a Case of Double Taenia Infestation (*T. solium* : : and *T. saginata*).—*Jl. Roy. Army Med. Corps.* 1930. Sept. Vol. 55. No. 3. pp. 216–217. With 2 text figs.

Barneoud. La bilharziose vésicale au Maroc.—*Marseille Méd.* 1930. Apr. 5. Vol. 67. No. 10. pp. 453–481. [1 ref.]

Cawston (Frederick G.). A Consideration of the Cause and Cure of Bilharzia Disease.—Reprinted from *Urol. & Cutaneous Rev.* 1929. Dec. Vol. 33. No. 12. pp. 817–820. With 4 text figs.

Cawston (F. G.). Les schistosomes rares de l'Afrique du Sud.—*Ann. Parasit. Humaine et Comparée.* 1930. July 1. Vol. 8. No. 3/4. pp. 259–262. With 2 text figs. [7 refs.] [Britannia Buildings, Durban, Natal.]

Chesneau (P.) & Tran-Van-Manh. Sur un cas d'hémiplegie ascaridienne.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1930. Apr. Vol. 8. No. 4. pp. 294–296.

Dassen (Rodolfo) & Rey (J. C.). Hidatidosis raquídea.—*Semana Méd.* 1930. Apr. 10. Vol. 37. No. 15 (1891). pp. 921–926. With 2 text figs. [1 ref.]

Delanoë (P.). Quatrième cas algérien de distomatose humaine à *Fasciola hepatica* L.—*Bull. Soc. Path. Exot.* 1929. Oct. 9. Vol. 22. No. 8. pp. 673–674. [1 ref.] [District Hosp., Mazagan, Morocco.]

Dixey (M. B. D.). A Case of Sudden Death due to Occlusion of the Larynx by *Ascaris lumbricoides*.—*West African Med. Jl.* 1929. July. Vol. 3. No. 1. p. 5. [1 ref.]

Du Toit (J. A.). Rare Sites for the Development of Hydatid Disease in Man.—*Jl. Med. Assoc. South Africa.* 1929. Sept. 14. Vol. 3. No. 17. p. 492. With 1 text fig.

Essex (Hiram E.) & Bollman (Jesse L.). Parasitic Cirrhosis of the Liver in a Cat infected with *Opisthorchis pseudofelineus* and *Metorchis complexus*.—*Amer. Jl. Trop. Med.* 1930. Jan. Vol. 10. No. 1. pp. 65–70. With 4 figs. [4 refs.]

Falcão (Edgard de Cerqueira). Filaria sub-conjunctival. (A proposito de uma nota do Dr. Edilberto Campos.)—*Brasil-Medico.* 1930. Jan. 25. Vol. 44. No. 4. pp. 104–105.

Girges (Rameses). The Clinical Aspect of Schistosomiasis Haematobium.—*Jl. Trop. Med. & Hyg.* 1930. June 2. Vol. 33. No. 11. pp. 149–159. With 4 graphs & 3 charts.

HELMY (Mahmoud Mustafa). An Easy and Accurate Method of Microscopical Diagnosis of Intestinal Bilharziasis.—*Jl. Egyptian Med. Assoc.* 1930. Feb. Vol. 13. No. 2. p. 65.

HINRICHSEN (H. M.). Verkalkte Zystizerken in der Muskulatur.—*Fortschr. Geb. Rontgenstrahlen.* 1929. Vol. 39. No. 4. pp. 666–669. With 5 figs.

HOEPPLI (R. J. C.). Parasitic Nematodes and the Lesions they produce.—*Nat. Med. Jl. China.* 1930. Feb. Vol. 16. No. 1. pp. 103–110. [Union Med. College, Peiping.]

KHOURI (J.). Note sur la bilharziose en Egypte.—*Rev. Prat. Malad. des Pays Chauds.* 1930. Jan. Vol. 10. No. 1. pp. 33–34. [1 ref.]

KOTAKE (Masakichi). Anchylostoma Larva in Mammary Gland.—*Osaka Igakka Zashi.* (*Jl. Osaka Med. Soc.*). 1929. Sept. Vol. 28. No. 9. [Summarized in *Japan Med. World.* 1930. Oct. 15. Vol. 10. No. 4. p. 75.]

NAUCK (Ernst G.). Gehirnzystizerkosis. Bericht ueber 3 Fälle aus Costa Rica.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1930. Mar. Vol. 34. No. 3. pp. 158–161. With 1 text fig. [San Juan de Dios Hosp., San José, Costa Rica.]

NEGISHI (Kenzo). Ueber die Eier von *Dicrocoelium lanceatum*, welche bei der menschlichen Stuhluntersuchung gefunden wurden.—*Okayama-Igakkai-Zasshi* (*Zent. d. Okayama Med. Gesellsch.*).—1929. Aug. Vol. 41. No. 8. pp. 1797–1801. With 1 fig. & 1 plate. [14 refs.] [In Japanese. German summary p. 1802.] [Bact. Inst., Med. Univ., Okayama.]

NOTO-SOEDIRO (R.). *Paragonimus westermani* (Kerbert) bij een kat.—*Nederl.-Indische Bladen v. Diergeneesk.* 1930. June. Vol. 42. No. 3. pp. 278–280. English summary (8 lines) p. 280.

OTTO (G. F.). *Ascaris lumbricoides*: Treatment, Loss of Worms and Reinfestation.—*Jl. Amer. Med. Assoc.* 1930. July 19. Vol. 95. No. 3. pp. 194–196. [12 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore.]

PANDIT (C. G.), PANDIT (S. R.) & IYER (P. V. Seetharama). The Development of the Filaria *Conispiculum guindiensis* (1929) in *C. fatigans*, with a Note on the Transmission of the Infection.—*Indian Jl. Med. Res.* 1929. Oct. Vol. 17. No. 2. pp. 421–429. With 19 figs., 1 graph & 2 plates. [1 ref.] [King Inst. of Preventive Med., Guindy, Madras.]

PARR (T.). Notes on Schistosomiasis in the Sudan.—*Jl. Roy. Army Med. Corps.* 1930. Apr. Vol. 54. No. 4. pp. 261–273. With 2 figs. (maps) in text.

PEILL (S. G.). Plasmoma and Filaria.—*China Med. Jl.* 1930. Sept. Vol. 44. No. 9. pp. 945–946.

RODRIGUEZ LOPEZ-NEYRA (Carlos). Datos para el esclarecimiento del ciclo evolutivo de las tenias del genero *Davainea*.—*Medicina Paises Cálidos.* Madrid. 1930. Jan. Vol. 3. No. 1. pp. 31–38. French summary. [Lab. of Zool. & Parasitol., Faculty of Pharm., Granada.]

STROM (J.). Einige Anomalien bei den parasitischen Plattwürmern.—*Cent. f. Bakt.* I. Abt. Orig. 1929. Vol. 111. pp. 500–502. With 3 text figs.

SWEET (W. C.). A Survey of Mysore State for Enlarged Spleens and for Hookworm and Other Helminthic Infections.—*Mysore Dept. of Health. Bull. No. 7.* Bangalore. 1929. 53 pp. With 2 maps, 1 chart & 11 figs. [9 refs.]

VOGEL (Hans). Magencarcinom der Ratte nach experimenteller Infektion mit *Hepaticola gastrica*.—Reprinted from *Ztschr. f. Krebsforschung.* 1929. Vol. 29. No. 4. pp. 351–359. With 5 text figs. [11 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

WHARTON (Denis R. A.). Immunological Studies with Tapeworm Antigens.—*Amer. Jl. Hyg.* 1930. Sept. Vol. 12. No. 2. pp. 511–536. [3 pages of refs.] [Dept. of Hyg. & Bact., Univ., Chicago.]

YOSHIMOTO (Seiichi). Untersuchung des Stoffwechsels bei *Clonorchiasis sinensis*. (*Distomiasis spalthulata* od. *Distomiasis hepatica.*) I. Mitteilung. Experimentelle Untersuchung über den Stickstoff-Stoffwechsel bei der Kaninchenclonorchiasis.—*Arb. a. d. Med. Univ. Okayama.* 1930. Aug. Vol. 2. No. 1. pp. 40–62. [17 refs.]

RABIES:

A REVIEW OF RECENT ARTICLES. XIV.*

i. *Virus.*

It will be remembered that at the International Conference on Rabies (1927) it was resolved that researches should be conducted on the plurality of street virus. This work has been taken up by REMLINGER and BAILLY[1] and a report is now submitted. The authors determined to limit their enquiry to strains (1) taken from individuals who had died of rabies in spite of treatment and whose wounds were of a trivial type, and (2) to viruses obtained from biting animals exhibiting abnormal symptoms but proved to be rabid by sub-inoculation. They investigated in the first instance a virus isolated by TÉODORASCU from two persons who had died of rabies in spite of intensive pasteurian treatment. This virus was said to have shown a total absence of cross immunity with the fixed virus employed at the institute (Chisinau). As the result of a series of protective experiments the authors found that the virus of Tangier protected against that of Chisinau, and conversely. The Chisinau strain, in this sense then, does not differ from the classic strain. A further series of experiments was carried out in which mixtures of vaccine and antisera were injected. Virus and antisera from fixed virus, from the Morocco strain and from the Rumanian strain, were set up each against the others, and injected into animals. It appeared that the antisera of fixed virus and of street virus of Morocco protected against all three viruses, whereas the serum from the Rumanian virus possessed no viricidal properties whatsoever. Although the Rumanian strain might be called a bad antigen, yet the sera of the other two viruses were antagonistic to it. That is, in the authors' opinion, the important practical point. They hold to their previously expressed opinion that polyvalent and auto vaccines are a useless complication of antirabic treatment.

In relation to the *oulou-fato* of West Africa DUPUY[2] describes a case of human rabies in Haute-Volta on the frontier of the Gold Coast, whilst SICÉ and BOISSEAU[3] report on the viruses obtained from two cases of canine rabies from French Equatorial Africa. DABBADIE[4] presents further evidence in favour of the view that *oulou-fato* is identical with rabies. The virus from a dog which exhibited symptoms of paralysis was passaged to the third generation through laboratory animals. The phenomena observed were those of ordinary rabies. The virus was not lost, nor did it become attenuated in virulence.

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* For the thirteenth of this series see Vol. 27, pp. 742–755.

1 REMLINGER (P.) & BAILLY (J.). Unicité ou pluralité du virus rabique.—*Ann. Inst. Pasteur.* 1930. Sept. Vol. 45. No. 3. pp. 376–385. [3 refs.] [Pasteur Inst., Tangiers.]

2 DUPUY (H.). Un cas de rage humaine en Haute-Volta.—*Bull. Soc. Path. Exot.* 1930. July 9. Vol. 23. No. 7. pp. 702–703.

3 SICÉ (A.) & BOISSEAU (R.). Contribution à l'étude de la rage canine (virus des rues) en Afrique Equatoriale Française.—*Bull. Soc. Path. Exot.* 1930. July 9. Vol. 23. No. 7. pp. 703–709. [9 refs.] [Pasteur Inst., Brazzaville.]

4 DABBADIE (P.). Transmission expérimentale de la rage canine en Haute-Volta à partir du virus d'un chien "fou" de race indigène.—*Bull. Soc. Path. Exot.* 1930. Oct. 8. Vol. 23. No. 8. pp. 857–859.

A case of human rabies occurring in the Gold Coast, is reported by HAWE and RUSSELL.[5] Negri bodies were found in the brain, and subpassage into six rabbits confirmed the diagnosis. In an editorial note attention is drawn to a previous case in 1925, and to a subsequent case in the Northern Territories of the Gold Coast. In both instances the diagnosis was confirmed by laboratory methods.

The degree of filtrability of the virus has been exhaustively re-examined by GLUSMAN, SOLOWJOWA, and PREDTETSCHENSKAJA.[6] They have found that the virus can pass through such wide pored bougies as Chamberland L_2 and L_3, but that the number of positive results is comparatively small. A number of precautions have to be observed in preparing the emulsion for filtration, for the details of which the reader is referred to the original communication. Eight emulsions were tested, the filtrates of five of these (L_1, L_2 and L_3) contained virus, and of the filtrates three (L_2, L_3 and L_5) did not produce typical rabies on inoculation. It appeared, however, that in addition to the ordinary symptomatic syndrome of rabies in the rabbit, an atypical form with absence of paralyses and lengthening of the incubation period occurred. The diagnosis of rabies in such cases could only be determined by the recovery of typical rabies after from 2 to 3 subpassages. In certain other cases the filtrate caused an ascending paralysis of the Landry type, which gave a negative result on subsequent subpassage through rabbits. Similar paralyses were observed after the administration of fixed virus which had been preserved over long periods in glycerine. The authors conclude that the virus of rabies is not a true filter passer ; and that in certain stages it is a visible microbe. Paralyses of the Landry type may be occasioned not only by the filtrate but also by unfiltered material.

In a further paper GLUSMAN, SADOWSKY and SOLOWJEWA[7] describe experiments in which an emulsion of rabies virus was mixed with virus of foot and mouth disease before filtration. The viruses behaved differently. Whilst that of the latter disease came through with its usual characteristics that of rabies was altered in the sense described in the previous paper. In agreement with the results arrived at in the previous paper it would appear that the virus of rabies consists mainly of unfiltrable forms.

STOEL[8] confirms LEVADITI'S observation that the virus of rabies is maintained and probably multiplies when placed *in vitro* in contact with cellular elements. He finds that the virus develops in contact with embryonic cerebrum in rabbit plasma, and he has succeeded in realising five virulent passages. It cannot be cultivated with other tissues such as Rous sarcoma, or in chicken plasma.

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[5] HAWE (J. A.) & RUSSELL (H.). A Case of Human Rabies.—*West African Med. Jl.* Lagos. 1930. Apr. Vol. 3. No. 4. pp. 77–78. [Med. Research Inst., Accra.]

[6] GLUSMANN (M. P.), SOLOWJOWA (J. W.) & PREDTETSCHENSKAJA (L. A.). Gehört der Erreger der Tollwut zu den Ultra-Virus ? I. Mitteilung.—*Zent. f. Bakt.* I. Abt. Orig. 1930. June 3. Vol. 117. No. 1/3. pp. 128–139. [27 refs.] [Bact. Inst., Kharkov.]

[7] GLUSMAN (M. P.), SADOWSKY (I. J.) & SOLOWJEWA (J. W.). Vergleichende Untersuchungen ueber die Filtrierbarkeit des Lyssa- und des Maul- und Klauenseuche-Virus.—*Zent. f. Bakt.* I. Abt. Orig. 1930. July 28. Vol. 117. No. 7/8. pp. 450–459. [6 refs.]

[8] STOEL (G.). Symbiose du virus de la rage avec les cultures cellulaires.—*C.R. Soc. Biol.* 1930. July 4. Vol. 104. No. 23. pp. 851–852. [2 refs.] [Pasteur Inst., Paris].

ii. *Clinical.*

Daleas and Haslé[9] report a case of accouchement during the course of rabies. The mother exhibited all the classic symptoms of the disease, but the accouchement was normal. The mother died eight hours later. The infant was detained for three months in the maternity hospital. She was removed by her relatives, and three days later died of acute gastro-enteritis.

Palawandow and Serebrjenaja[10, 11] have succeeded in proving that the saliva taken from two patients on the day previous to death contained the virus. For a successful result they found that intramuscular injection of large quantities (not less than 2 cc.) of saliva was necessary, and that the inoculated animals should be kept under observation for not less than six months. Negri bodies were not found in the brains of the inoculated animals in the earlier subpassages, but in the later they were invariably present. They conclude that in the exceptional case of persons *bitten* by rabid human beings treatment should be administered.

Bablet, Joyeux, and Leclerc[12] summarize the results of their experience of rabies in Tonking. From statistics relating to 58 cases of rabies in human beings, the incubation periods were as follows: one less than 14 days; 8 between 14 and 19 days; 23 between 20 and 25 days; 13 between 26 and 30 days; 11 between 31 and 40 days; and two more than 40 days. Thus 77 per cent. of the incubations were less than 31 days. "Since European statistics fix about 25 per cent. as the corresponding proportion, it would appear that Tonking rabies causes *rage précoce* three times more frequently than do European strains." This is partly attributed to a special sensitiveness of the Annamite race to the virus. The street virus of Tonking behaves similarly to that of Cochin China. The authors emphasize the importance of the stray dog in the dissemination of rabies, and plead for its methodical destruction.

iii. *Pathology.*

The pathology of a case of encephalomyelitis following antirabic treatment is fully described by Bassoe and Grinker.[13] The appearances were those of perivascular infiltrations with demyelinization and axis cylinder destruction. A typical toxic reaction was observed in the ganglion cells, the vascular endothelium and the oligodendroglia. Mucocytes were found, and free mucin in places had escaped from the

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9 Daleas & Haslé. Accouchement d'un enfant au cours d'une rage.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1930. Mar. Vol. 8. No. 3. pp. 258–259.

10 Palawandow (Haidar) & Serebrjenaja (A. I.). Ueber die Anwesenheit des Tollwutvirus im menschlichen Speichel.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 66. No. 5/6. pp. 519–529. [17 refs.] [Bact. Inst., Odessa.]

11 Palawandow (Haidar) & Serebrennaja (A. I.). Zur Frage der Virulenz des Speichels von an Tollwut erkrankten Menschen.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 68. No. 3/4. pp. 236–242. [8 refs.] [State Bact. Inst., Odessa.]

12 Bablet (J.), Joyeux (B.) & Leclerc. La prophylaxie de la rage au Tonkin. —*Bull. Soc. Méd.-Chirurg. Indochine.* 1930. July. Vol. 8. No. 7. pp. 687–715. [6 refs.]

13 Bassoe (Peter) & Grinker (Roy R.). Human Rabies and Rabies Vaccine Encephalomyelitis. A Clinicopathologic Study.—*Arch. Neurol. & Psychiatry.* 1930. June. Vol. 23. No. 6. pp. 1138–1160. With 16 text figs. [23 refs.] [Med. College & Med. Dept., Univ., Chicago.]

mucin-containing cells. The appearances in a second case in which, after an incubation of about a year, rabies "was stimulated into activity by trauma to the bitten hand two weeks before death," are also described. In the brain Negri bodies were observed. The differences between the pathological conditions observed in the two cases are discussed. The authors state that "the evidences of inflammation, the identity of rabies vaccine, cowpox vaccine, variola and measles, nervous lesions, and the perivascular softenings in subacute rabies suggest that the vaccinal lesions represent an attenuated rabies virus disease transmitted by the vaccine."

Nicolau, Viala and Kopciowska[14] have failed to find any evidence of the presence of fixed virus in rabbits which have received pasteurian treatment. Submitting emulsions of nervous material to cataphoresis had no effect. Certain histological changes were observed in the brain, medulla, and spinal ganglia. These will be described in a later communication.

Although there can be no doubt that the virus of rabies is transmitted in general from the bite to the central nervous system by the nerves, the fact that it has been proved to be present in the blood of various organs suggests that other paths of transmission are possible. In order to elucidate this question Schweinburg and Windholz[15] have made further studies. They consider in the first place that the existence of alternative routes can only be tested by interrupting the nerve path from the seat of the bite to the central nervous system. Following the method of v. Gielbergs, they attain union between the skin of the back of one rabbit, and a flap from another rabbit. Within six days anastomoses develop, and union is complete. This is what is meant by *parabiosis*. From observations on eighteen such couples of rats they found that in every case after a test dose of rabies had been administered the infected rat died, and the presence of rabies in its brain was proved. None of the parabionts contracted the disease.

From the summary in French of Yovelev's[16] paper on infection through the blood stream, it appears, that all animals inoculated intravenously with massive doses of fixed virus have resisted infection. This resistance is ascribed to the existence of the hematoencephalic barrier. The destruction of this barrier by artificial means (pumping) leads to infection. Simple extraction of the cerebro-spinal fluid is in most cases insufficient.

Zuwerkalow and Goldenberg[17] find that a number of chemical changes occur in the blood as a result of rabies in experimental animals. In the first days of the disease the cholesterin content is

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14 Nicolau (S.), Viala (J.) & Kopciowska (L.). Peut-on mettre en évidence le virus rabique fixe dans le système nerveux des animaux vaccinés à l'aide de la méthode pasteurienne ?—*C.R. Soc. Biol.* 1930. Sept. 20. Vol. 104. No. 26. pp. 1134–1136. [2 refs.] [Pasteur Inst., Paris.]

15 Schweinburg (Fritz) & Windholz (Franz). Ueber den Ausbreitungsweg des Wuterregers von der Eintrittspforte aus. (Untersuchungen an parabiosierten Ratten.)— *Virchows Arch. f. Path. Anat.* 1930. July 24. Vol. 278. No. 1. pp. 23–34. [14 refs.]

16 Yovelev (B.). Sur quelques conditions d'infection rabique par la voie sanguine.—*Arch. Sci. Biol.* 1930. Vol. 30. No. 4. pp. 459–465. [15 refs.] [In Russian. French summary p. 466.]

17 Zuwerkalow (D.) & Goldenberg (I.). Cholesterin und P-Lipoid bei experimenteller Tollwut.—*Biochem. Ztschr.* 1930. Oct. 10. Vol. 226. No. 4–6. pp. 278–285. With 2 text figs. [7 refs.] [1st Ukrainian Sanit. Bact. Inst., Kharkov.]

increased, not so much as a result of the specific infection, but rather from the reduction of water, which naturally occurs during the hunger period of rabies. The P-lipoids of the blood increase at the same time in a characteristic manner.

The pH of the brain of normal animals, and of those which have died of rabies, has been investigated by GUBIN and GOLDINA.[18] That of the normal rabbit and guineapig is weakly alkaline (7·26 in the cerebral hemispheres). On the third day after intracerebral inoculation of fixed virus, the pH falls to 6·89 in the hemispheres, and remains at about that level till the sixth day, after which it again rises and reaches a maximum on the day of death (average 8th day). Corresponding values for other parts of the brain and cord are included in the paper.

NICOLAU and KOPCIOWSKA[19, 20] state that the virus of rabies contained in emulsions of cerebrum, the pH of which lies between 7·4 and 5·8, possesses a negative electric charge, and migrates towards the positive pole. For the determination of this charge the authors recommend the apparatus of TODD in preference to that of OLITSKY. Liquid collected at the positive pole is virulent whilst that collected from the neighbourhood of the negative pole is avirulent. They have attempted to prove the presence of the virus in the brains of rabbits which have died of "*neuro-infections autosterilizées*" by this method, but have failed.

iv. *Methods of Treatment, and Statistics.*

A first review[21] of the statistics furnished by Pasteur Institutes, as a result of the resolution adopted at the Rabies Conference held in 1927 at Paris under the auspices of the Health Section of the League of Nations, has been published. The statistics relate to thirty-one institutes, and afford information regarding 31,656 treated cases. In the appendices to this review the schedules filled in by the authorities at each institute are printed, so that full details are available for further perusal and study. The material has been summarized and analysed by MCKENDRICK, and the usual statistical methods have been applied to the elucidation of the many problems which present themselves. The statistical material is only a fraction of that which would be available if returns had been received from all institutes. (It is to be hoped that in future years these will be greatly augmented.) The material is also insufficient for the interpretation of problems which necessitate its subdivision into a considerable number of groups. Certain points, however, appear to emerge in a definite manner. It appears that a subdivision of the statistics into those which relate to

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18 GUBIN (W. M.) & GOLDINA (R. B.). Ueber die aktuelle Reaktion der Hirnsubstanz bei experimenteller Tollwut.—*Zent. f. Bakt.* I. Abt. Orig. 1930. Mar. 4. Vol. 116. No. 1. pp. 76–80. [4 refs.] [Metschnikoff Inst. for Infectious Diseases, Moscow.]

19 NICOLAU (S.) & KOPCIOWSKA (L.). Virus rabique et cataphorèse.—*C.R. Soc. Biol.* 1930. Sept. 20. Vol. 104. No. 26. pp. 1142–1143. [3 refs.] [Pasteur Inst., Paris.]

20 NICOLAU (S.) & KOPCIOWSKA (L.). Essais de réactivation, à l'aide de la glycérine ou de la cataphorèse, du virus rabique dans le cerveau de certains lapins morts de "neuro-infection autostérilisée."—*C.R. Soc. Biol.* 1930. Sept. 20. Vol. 104. No. 26. pp. 1139–1142. [3 refs.] [Pasteur Inst., Paris.]

21 MCKENDRICK (A. G.). Analytical Review of Reports from Pasteur Institutes on the Results of Antirabic Treatment.—League of Nations. Health Organisation. L.o.N.P. III. Health. 1930. III. 2. 158 pp. Geneva.

European and non-European groups respectively is a primary necessity. There is a marked degree of correlation between race type and mortality rate, in that where the proportion of non-Europeans is high, the mortality is high, and conversely. Comparisons of the various methods of treatment are rendered possible only when the two race types are treated separately. These comparisons have been made, and as the result of various methods of statistical analysis it has not been possible, from the figures available, to find decisive evidence that any clear advantage exists in favour of any one of the various methods of treatment under consideration. In particular it has not been possible to demonstrate superiority of methods employing living vaccines, over those in which killed vaccines are used.

Within the European group the differences between the death rates of the various institutes are not greater than would be expected as the result of chance variations. A similar statement is also true with regard to the non-European group, but it is not true with regard to the whole statistics embracing the two groups. It is interesting to note that this racial distinction (viz., that the non-European who presents himself for treatment is at a higher degree of risk than the European) is eliminated, as might be expected, in the case of persons bitten by wolves. The fatality amongst persons bitten by these ferocious animals does not significantly vary whether the treatment be that of dried cords, killed phenol vaccines, or ether vaccines (not killed). It is also interesting that the same elimination appears to occur in relation to persons grouped under Categories A and B, but not to persons grouped under Category C. The mortalities for Categories A and B do not significantly vary whether the vaccines be living or dead, whilst differences between the mortalities for Category C are highly significant. This suggests that the European as compared with the non-European is at a definitely lower degree of risk not only on account of a lesser degree of severity of bite, but also with regard to the rabidness of the biting animal. For definite adjudication on these latter points, however, larger statistics are essential. "It is emphasized that the negative conclusions regarding the relative efficiencies of the various methods of treatment are only provisional and that more positive results may come to light when fuller and larger statistics are available." Statistics relating to the occurrence of paralytic accidents will be referred to in Section v below.

Attention has been drawn to statistics and animal experiments by Cunningham and Malone (this *Bulletin*, Vol. 27, p. 742), and to experiments by Gloster, Beer, Nambiar and Sastry (this *Bulletin*, Vol. 27, p. 259) on the relative efficacies of carbolized and etherized vaccines. It will be remembered that the results were in favour of the latter when each vaccine was administered in the dosage commonly employed with that vaccine; but that there was no significant difference when the two types of vaccine were administered in the same dosage. It appeared from the experiments of Gloster and his co-workers that the efficacy of treatment by large doses of carbolized virus occupied a position somewhere between treatment by small doses of carbolized vaccine, and treatment by large doses of etherized vaccine, but that from the available data this position could not be exactly defined. This lacuna is now filled up by Taylor and Menon.[22]

22 Taylor (J.) & Menon (K. N.). Experiments in Dosage of Carbolized Anti-Rabic Vaccine.—*Indian Jl. Med. Res.* 1930. Oct. Vol. 18. No. 2. pp. 711–722. [2 refs.]

Three experiments were carried out in which a control group of rabbits was compared with similar groups treated by varying multiples of human doses of carbolized vaccines (SEMPLE).

The protocols are as follows :—

	Original number of animals.	Remaining for test.	Died of rabies.	Died otherwise.	Survived.
Experiment 1 :—					
Controls	10	10	9	1	0
Equivalent human dose	10	10	5	0	5
5 times above dose ...	10	9	4	1	4
10 ,, ,, ,, ...	10	8	0	2	6
Experiment 2 :—					
Controls	10	10	10	0	0
5 times above dose ...	10	10	4	1	5
Ditto filtered	10	10	8	0	2
,, ,, ...	10	10	9	0	1
Experiment 3 :—					
Controls	10	10	10	0	0
Equivalent human dose	10	9	8	0	1
5 times above dose ...	10	10	5	0	5
Equivalent human dose etherized and carbolized	10	10	10	0	0
Ditto, 5 times dose ...	10	10	3	1	6

Thus the efficacy of the treatment can be enhanced by increasing the dosage of the vaccine. Filtration greatly reduces immunizing power, and preliminary extraction with ether does not sensibly affect the efficaciousness of the vaccine. [The results of a large statistical experiment on human beings by CUNNINGHAM and MALONE will shortly appear.]

As the result of a number of experiments GALLEA[23] finds that formlo (1 per cent.) completely inactivates the virus of rabies after 24 hours contact. The virus, however, retains its antigenic properties, as was shown by the following experiment. Each of eleven rabbits received three doses of 20 cc. of vaccine at intervals of two days. They were submitted to an intra-ocular test dose 12 to 15 days later, and all survived. Of an equal number of controls all succumbed.

At the Pasteur Institutes of Coonoor and Bombay the sheep is occasionally used in place of the rabbit as a source of fixed virus. IYENGAR and BEER[24] have for practical reasons made observations on the effect of ether on the brain of sheep. They find that when the

[23] GALLEA (M.). Action du formol sur les émulsions de virus rabique de rue ; vaccination du lapin contre la rage avec le virus de rue inactivé par le formol.—*C.R. Soc. Biol.* 1930. June 6. Vol. 104. No. 19. pp. 520–522.

[24] IYENGAR (K. R. K.) & BEER (W. A.). Studies in the Value of Etherized Sheep Vaccine in the Prophylactic Treatment of Rabies. Part I. The Effect of Ether on " Fixed Virus " in Infected Brains of Sheep.—*Indian Jl. Med. Res.* 1930. July. Vol. 18. No. 1. pp. 1–4. [3 refs.] [Pasteur Inst. of Southern India, Coonoor.]

brain is cut into large pieces, immersion for 84 hours has no effect upon virulence. When the pieces are small (minced) immersion for 72 hours attenuates, and immersion for 96 hours kills the virus.

For a number of years REMLINGER and BAILLY[25] have used dogs and herbivora for the production of fixed virus for use, after being etherized, on animals. The brain of a dog affords the same quantity of vaccine as 10 rabbits.

A statistical summary of the experience of antirabic vaccination of man during the years 1891–1928 at the Pasteur Institute of Saigon (Cochin China) is presented by BABLET and others.[26] The resistance of the Saigon strain of fixed virus to desiccation, and to dehydration in glycerine has notably diminished. This diminution is of the same order as that observed by BURNET in Tunis. The incubation period of street virus rabies is shorter in Saigon than it is in Europe (BABES). The method of treatment employed is the glycerine method of CALMETTE. Since 1925, only cords which have been desiccated for 2 to 6 days are employed, and these are not preserved in glycerine for more than 10 days. From 1891 to 1929 a total of 9,000 persons have been treated, and in only 2 cases have untoward paralytic symptoms been observed. These were of a slight nature, and recovery was rapid.

The number of persons treated annually rose from 26 in 1891, to about 60 between the years 1892 and 1902; to between 100 and 150 from 1902 to 1916, and then rapidly increased until in 1928 it had reached 1,273. The failure rate has correspondingly declined since 1892 when it was 5 per cent. to below 0·6 per cent. in later years. The mean number of failures per annum is 0·15 per cent. since 1908. If persons dying within 15 days after the completion of treatment are included, the mean mortality is 0·39 per cent. Numerous tables relating to statistics from 1908–1928 are included in the report.

From these it appears that Europeans number 1,574, as compared with 7,581 indigenous persons. The distribution of bites is as follows: On the head 421, of which 14 terminated fatally; on the hands 2,424, of which 7 were fatal; on the leg 6,263, of which 9 were fatal. Total 9,108, with 30 deaths.

The statistics of the Pasteur Institute in Paris for the year 1929 are presented by VIALA.[27] Of 542 persons treated none developed rabies. Since 1911 when CALMETTE's glycerine method was adopted no accident, paralytic or other, has been observed.

OUCHAKOV[28] furnishes statistics regarding 1,046 persons treated at a Russian Institute. Of these one succumbed (mortality 0·09 per cent.). The method employed was that of FERMI.

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25 REMLINGER (P.) & BAILLY (J.). Substitution du cerveau de chien au cerveau de lapin dans la préparation du vaccin antirabique vétérinaire.—*C. R. Soc. Biol.* 1930. May 9. Vol. 104. No. 15. pp. 18–19. [1 ref.] [Pasteur Inst. of Morocco, Tangiers.]

26 ARCHIVES DES INSTITUTS PASTEUR D'INDOCHINE. 1929. Oct. No. 10. pp. 3–33. With 2 charts. [56 refs.]—La rage et la vaccination antirabique en Cochinchine.

27 VIALA (Jules). Les vaccinations antirabiques à l'Institut Pasteur en 1929.—*Ann. Inst. Pasteur.* 1930. May. Vol. 44. No. 5. pp. 619–623.

28 OUCHAKOV (V.). Service antirabique de l'Institut de Médecine Expérimentale. (Rapport annuel pour l'année 1929.)—*Arch. Sci. Biol.* 1930. Vol. 30. No. 4. pp. 507–516. [In Russian. French summary pp. 516–517.]

D'Aunoy and Miller[29] report on the operations of the Pasteur Institute of New Orleans (U.S.A.) during the year 1929. The method used is that of Semple (4 per cent. brain substance in ½ per cent. phenol after 24 hours incubation at 37·5° C.). Of 766 patients treated one who was severely bitten on the face succumbed to rabies. No post-vaccinal paralyses were encountered.

A statistical review of treatment at Oddzialu (Poland) is presented by Karłowski.[30] The summarized figures are as follows :—

	At Oddzialu.		At out stations.
1924	2,552 (8)	200 (0)	0
1925	905 (6)	352 (2)	0
1926	804 (1)	0	1,577 (5)
1927	399 (3)	0	1,496 (1)
1928	0	233 (0)	944 (1)
	4,660 (18)	785 (2)	4,017 (7)

The number of fatal cases is given in brackets. Patients in the second two columns were treated with carbolized vaccine. The first two columns, I gather, refer to persons treated at the Institute, and the third to those treated at out stations.

A résumé of antirabic treatment in the French colonies is presented by Boyé.[31] 263 persons have been treated with no deaths, at *Dakar* in French West Africa. "A number" have been treated at *Brazzaville* in Equatorial West Africa with no untoward results. In *Madagascar* 67 persons were treated during 1927 with no deaths.

With regard to Indo-China : at *Hanoi*, in 1927, 538 were treated, of whom 5 succumbed from rabies ; at *Saigon*, in 1927, of 1,431 treated, 1,136 completed treatment, and 4 died of rabies during its course ; at *Hué*, of 256 who completed treatment one died ; at *Laos*, 28 persons were treated with no deaths.

Antirabic treatment was commenced in Malaya in 1924. Lewthwaite[32] discusses the question of centralization, and states that in Malaya a compromise has been adopted, a central institute operating at Kuala Lumpur, from which vaccine is transmitted to practitioners in the provinces, who have undergone a course of instruction at the central institute. The method of Semple has been followed. As there are no wolves or jackals in Malaya an attempt was made to control the spread of the disease by inoculating dogs according to the Japanese method, using fixed virus first from the sheep, and later, for reasons of economy, from the buffalo calf. It is stated that the brain and cord of an Australian sheep yield some 60 doses of vaccine,

29 d'Aunoy (Rigney) & Miller (J. W.). Report of the Pasteur Institute of the Charity Hospital for the Year 1929.—*New Orleans Med. & Surg. Jl.* 1930. June. Vol. 82. No. 12. pp. 864–866. [Charity Hosp., New Orleans.]

30 Karłowski (Zenon). Działalność oddziału pasteurowskiego w Roku 1928. Activité de la section antirabique de l'Institut.—*Medycyna Doświadczalna i Społeczna.* Warsaw. 1930. Vol. 12. No. 3/4. pp. 257–274. [In Polish.]

31 Boyé. Le service antirabique dans les colonies françaises.—*Bull. Office Internat. d'Hyg. Publique.* 1930. May. Vol. 22. No. 5. pp. 932–935.

32 Lewthwaite (R.). The Prophylaxis of Rabies in Malaya.—*Malayan Med. Jl.* 1930. June. Vol. 5. No. 2. pp. 66–67.

whereas those of a buffalo calf, from one to two years of age, and costing twice as much as a sheep, yield some 300 doses. The course of rabies in the buffalo calf differs in no way from that in the sheep, the incubation period for fixed virus being in both instances 6 days. More than 3,000 dogs were inoculated in January of this year, and the beneficent effect of this measure upon the endemicity of the disease will, it is expected, appear in due course.

v. *Post-vaccinal Paralyses.*

The following statistics of paralytic accident after antirabic treatment by various methods, collected in the United States from January, 1929, to April, 1930, are given by McCoy.[33]

Type of treatment..	Cases treated.	Paralyses.	Ratio.	Remarks.
Killed virus (Semple method and modifications)	17,645	6	1:2,941	4 fatal, 2 partial recovery.
Frozen and desiccated virus (Harris method and modifications)	4,148	2	1:2,074	2 recovered.
Living diluted virus (Högyes method and modifications) ...	2,593	0	—	—
Attenuated virus (Pasteur method)	1,077	0	—	—

At the Hygienic Laboratory " there were during the nearly 13 years in which we produced antirabic vaccine, 4 known cases among over 1,800 persons treated." [These figures are not in accordance with those published from other institutes, and the author advises caution in their interpretation. The most unusual factor is the high mortality rate of accidents occurring after treatment by killed carbolized vaccine. A case of this type is reported by Stuart and Krikorian (below), but such instances, so far as present experience goes, are very rare. Full particulars regarding the cases collected by McCoy would be of great benefit to those engaged in antirabic treatment.] As a contrast to McCoy's figures I may quote from the figures collected by the League of Nations, and published in their first report.[21]

	Number treated.	Accidents.	Ratio.
Dried cords	2,318	5	1:464
Dilutions...	6,362	2	1:3,181
Phenol vaccines ...	17,538	1	1:17,538
Ether (not killed) ...	3,634	0	—
Ether killed	1,356	0	—

[33] McCoy (G. W.). Antirabic Vaccine Paralysis. Consideration of Various Vaccines.—*Public Health Rep.* 1930. Aug. 15. Vol. 45. No. 33. pp. 1888–1891.

Those treated by dried cords may be further subdivided: In the case of 399 the cords had not been submitted to the action of glycerine and amongst these one non-fatal accident was observed. In the case of the remaining 1,919 the cords had been glycerinated; amongst these 4 exhibited symptoms of paralytic accident, none of which had a fatal termination.

Of the two cases of accident after treatment by the dilution method one terminated fatally. The single case reported after treatment by phenol vaccines (at Lwow, by Mulford's vaccine) recovered.

A statistical review of the occurrence of paralytic accidents in Siberian institutes is presented by LAMAKINE.[34] NÉBOLABOV has found in the literature descriptions of 20 cases prior to 1915. DOUBROVINSKY quotes 48 cases prior to 1924. "It is certain that this figure is much below the reality." The author quotes 5 cases at Tomsk in 1922, all of the Landry type, three of which terminated fatally. The dried cord method was employed at Tomsk from 1906 to 1923. Up to 1914, 10,791 persons had been vaccinated without accident. The first case was reported in February, 1914. From 1914 to 1923 with the same treatment, 11,031 persons were treated without complication. In 1923 the dried cord method was replaced by that of HÖGYES and up to 1926, 1,739 persons were treated with no untoward results, and with a mortality of 0·2 per cent. Cases are carefully followed up, reports being received after from 3 to 6 months from 80 per cent. of those treated. It is only since 1926 that an undue number of paralytic accidents has been observed, 5 at Novo-Sibirsk, 3 at Barnaul, 2 at Minusinsk and 1 at Irkutsk. Out of a total of 4,500 persons treated during 1927 at the above centres, then, 17 cases have occurred, and 10 of these terminated fatally, i.e., 3·8 per mille of occurrence, with a fatality of 58·8 per cent. [This review is taken from the French summary. There are many points upon which further information would be welcome. It is not possible, even with the additional information furnished by the U.S.S.R. in the League of Nations report,[21] to state precisely what method of vaccination was employed. In that report 9 cases of accident after treatment by the Högyes-Phillips method with 6 deaths; 8 cases by the Pasteurian method with no deaths; and 3 cases by Fermi's method of which one terminated fatally, are stated to have occurred during the year 1927.]

A case of fatal neuro-paralytic accident of Landry type, following treatment by killed carbolized vaccine is described by STUART and KRIKORIAN.[35] The patient had no obvious neurotic tendency. On the day when he had received his last (14th) injection, symptoms of muscular weakness commenced. These rapidly progressed—on the next day he could not raise his arms; the legs were totally paralysed, as was also the bladder. On the 3rd day both arms were completely paralysed. A transfusion of blood was given. Death supervened early on the 5th day. The patient had received 0·7 gm. of nervous substance in all, in 5 cc. doses of a 2 per cent. emulsion in 1 per cent. phenol, incubated at 37° C. for 24 hours. The authors then discuss paralytic accidents in general, and refer to their own experiments

[34] LAMAKINE. Complications consécutives aux vaccinations anti-rabiques.—*Rev. Méd. de Sibérie.* Novo-Sibirsk. 1929. June–July. pp. 56–76. [Summarized in *Bull. Office Internat. d'Hyg. Publique.* 1930. May. Vol. 22. No. 5. pp. 1022–1023.]

[35] STUART (G.) & KRIKORIAN (K. S.). A Fatal Neuro-Paralytic Accident of Antirabies Treatment.—*Lancet.* 1930. May 24. pp. 1123–1125. [9 refs.] [Central Labs., Health Dept., Jerusalem.]

(this *Bulletin*, Vol. 26, p. 732). They believe that the causal factor is nerve substance, whether homologous or heterologous. In rabbits and white rats its effects can be prevented by exposure to phenol and heat: but "apparently in the basic nerve substance of all anti-rabies vaccines, there exists some deleterious component which, although adversely affected by several physical and chemical agencies, is still capable, in peculiarly susceptible human beings, of exciting symptoms of those nervous disorders classified as paralytic accidents of antirabic treatment." This component has not as yet been identified. Actual occurrence is governed by individual idiosyncrasy.

vi. *Rabies in Animals.*

A very complete résumé of the practice and results of antirabic treatment as applied to the larger farm animals which have been bitten by rabid dogs (etc.) is given by STOLNIKOFF.[36] After an exhaustive survey of the literature bearing on the subject, and a critical examination of the success which is claimed for the various methods which have been employed, the author pleads for a thorough examination of the solidity of the immunity conferred, and of its commencement and duration. With this object in view he recommends the collection of complete statistics regarding the untreated as well as the treated. All observations must be thoroughly controlled, and every effort should be made to find an experimental basis for the comparison of the various methods which have been adopted. [The attention of veterinarians is specially directed to this important paper. The solution of the problem is fraught with difficulties. The statistics are few, and the additional complexity due to the wide range of size and species of the animals under consideration further obscures the issue. Indian, Japanese and Russian authorities have recognized the importance of acquiring more definite information regarding the efficacy of treatment in these cases, and it is to be hoped that in time some definite results will emerge.]

Attention is drawn by STEEVENSON[37] to the frequency of pyrexia as a premonitory symptom in horses, mules and donkeys. In five serial cases observed during the years 1927 and 1928 at Sialkot (India) the animals were admitted to hospital on a diagnosis of simple fever and symptoms of rabies did not appear until the second or third day of detention. This is an important point in veterinary practice in countries where rabies is endemic.

REMLINGER and BAILLY[38] have inoculated 15 frogs (*Bufo mauritanicus*) with a virulent street virus. Three have remained alive for 535 days; nearly all the others died between the 162nd and the 465th day. In each case of death the brain was subpassaged, with negative result. Thus *Bufo mauritanicus* is completely refractory even as *Rana temporaria* is.

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[36] STOLNIKOFF (W. I.). Die gegenwärtige Anwendung von Schutzimpfungen gegen Tollwut an grossen Landwirtschaftstieren.—*Ztschr. f. Infektionskr. d. Haustiere.* 1930. May 12. Vol. 37. No. 3/4. pp. 234–251. [43 refs.]

[37] STEEVENSON (G. F.). A Note on the Occurrence of Pyrexia as a Premonitory Symptom of Rabies in Horses.—*Jl. Roy. Army Vet. Corps.* Aldershot. 1930. Aug. Vol. 1. No. 4. pp. 250–251.

[38] REMLINGER (P.) & BAILLY (J.). Le crapaud (*Bufo mauritanicus*) est réfractaire à la rage.—*C.R. Soc. Biol.* 1930. Nov. 14. Vol. 105. No. 30. pp. 353–355. [1 ref.] [Pasteur Inst. of Morocco, Tangiers.]

Remlinger and Bailly[39] report in greater detail their observations on rabies in the cock and pigeon described in my previous summary (this *Bulletin*, Vol. 27, p. 753). From further experiments on pigeons they show that these birds do not appear to react to the virus as the cock does, by the production of the phenomenon of latency.

Jonesco[40, 41] reports that he has fixed a strain of virus obtained from a wolf by 16 successive subpassages through dogs. The virus now in its 30th passage remains fixed. He also advises that a fixed virus so prepared should be used for the vaccination of dogs.

Remlinger[42] discusses the possibility of introducing the antirabic vaccination of dogs into France. He considers it to be practical. He believes that the duration of immunity may be about three years. The treatment does not cause local accidents. It is not infallible; doses of 120 cc. of ether emulsion are sufficient to immunize. The method is simple, efficacious and inoffensive; it should be authorized in France where a number of institutes are in a position to prepare the necessary doses.

A monograph by van Huyen[43] is summarized by Panisset. It relates to researches on glycero-formol vaccine in the treatment of dogs. No details of these researches are given in the summary. A communication dealing with antirabic treatment in general is submitted by Verge and van Huyen.[44]

vii. *Miscellaneous.*

Herrmann[45] in investigating the duration of immunity in animals which have received a course of treatment, has found that in certain of these the immunity is solid and may last for a year. Although this immunity is solid in many cases, it has never been absolute, as was shown by repetitions of the test dose. In the majority of cases, however, the duration of the immunity is much less than a year. [The duration of immunity is not an easy magnitude to determine. The numbers of animals available for testing after long periods must of necessity be few. The observations quoted in this paper whilst adding to our knowledge do not elucidate the problem. It is not often that a person is bitten twice by a rabid animal during a comparatively limited period of time, and when such cases do occur, it would appear inadvisable to depend upon the immunity conveyed by a previous course of antirabic treatment.]

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39 Remlinger (P.) & Bailly (J.). Comportement du virus rabique dans l'encéphale du coq et du pigeon.—*Ann. Inst. Pasteur.* 1930. July. Vol. 45. No. 1. pp. 42–53. [3 refs.] [Pasteur Inst., Tangiers.]

40 Jonesco (Demetre). Le virus rabique fixe pour le chien.—*C.R. Soc. Biol.* 1930. June 20. Vol. 104. No. 21. pp. 717–719.

41 Jonesco (Demetre). Vaccination préventive antirabique des chiens au moyen du virus fixe pour le chien.—*C.R. Soc. Biol.* 1930. June 20. Vol. 104. No. 21. pp. 719–720.

42 Remlinger (P.). La vaccination antirabique préventive du chien doit être autorisée en France.—*Rec. de Méd. Vét.* 1930. Sept. Vol. 106. No. 9. pp. 526–530. [3 refs.]

43 van Huyen (Pham). La vaccination antirabique chez les animaux. Recherches sur un vaccin glycéro-formolé.—*Bull. Acad. Vét. de France.* 1930. July. Vol. 3. No. 7. pp. 316–318.

44 Verge (J.) & van Huyen (Pham). Recherches sur la vaccination antirabique du chien.—*Rec. Méd. Vét.* 1930. May. Vol. 106. No. 5. pp. 249–268.

45 Herrmann (Otto). Dauer des Impfschutzes gegen Lyssa.—*Zent. f. Bakt.* I. Abt. Orig. 1930. June 3. Vol. 117. No. 1/3. pp. 141–145. [6 refs.] [Lenin State Inst. for Med. Research, Kasan.]

The view of JOSEPH KOCH that antirabic inoculation has a deleterious effect on chronic tuberculosis is submitted to experimental test by GLUSMAN and GOLDENBERG.[46] From observations on guineapigs they have been unable to find any evidence to support KOCH's view. Immunity against rabies develops in tuberculous guineapigs in the usual manner. The presence of tuberculosis should not then be considered as contra-indicating antirabic treatment.

In continuation of a previous communication (this *Bulletin*, Vol. 26, p. 221), LEGEZYNSKI and MARKOWSKI[47] report further observations. The negative results which they obtained in their previous series of experiments contrasting various methods of treatment are ascribed to the destruction of the immunizing properties of the vaccines by 1 per cent. phenol, and to plurality of strains.

Prior to the Great War there was no Pasteur Institute in the territory now called Czechoslovakia.[48] An institute was opened at Košice in 1928. The vaccine employed in the first instance was formolized, " after the method of Cumming." The method of Fermi is now employed. The vaccine is sent out in ampoules, which contain a suspension of 5 per cent. of brain substance filtered through a triple layer of gauze, in ½ per cent. phenol.

A more or less general communication by DE FREITAS[49] deals with experimental studies carried out at the Pasteur Institute at Pernambuco. These relate to points which have already for the most part been accepted. Although no figures are given to support his contentions, the author states that the dried cord and Högyes methods of treatment are equally effective, and that preventive inoculation of animals with single doses of phenol glycerinated vaccine from cords of vaccinated dogs and from rabbits' cords containing fixed virus " have been very successful."

BARCHI[50] describes the effects of colloidal sulphide of arsenic, colloidal sulphide of antimony, and " Pallina da caccia " on guineapigs which had previously been inoculated with fixed virus. Four animals were treated with the first drug, 3 with the second, 4 with the third, and there were three control animals. The injection was given intravenously. A further series were similarly treated with other chemical- (one animal in each case). It appeared that colloidal suspensions of lead, antimony, tin, arsenic, had no influence on the course of the disease.

MARIE and URBAIN[51] report experiments which show that whilst salicylate of soda has a destructive action on the virus *in vitro*, it has

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[46] GLUSMAN (M. P.) & GOLDENBERG (J. I.). Zur Frage ueber den Einfluss antirabischer Impfungen auf den Verlauf der experimentellen Tuberkulose bei Meerschweinchen.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1930. Vol. 67. No. 1/2. pp. 187–196. [Sanit. Bact. Metschnikoff-Inst., Kharkov.]

[47] LEGEZYNSKI (S.) & MARKOWSKI (S.). Recherches expérimentales sur la vaccination antirabique chez le chien.—*C.R. Soc. Biol.* 1930. May 23. Vol. 104. No. 17. pp. 312–313. [3 refs.]

[48] BOUČEK (Jaromír). Laboratoire de production du vaccin antirabique.—*Trav. Inst. d'Hyg. Pub. Etat. Tchécoslov.* 1930. Apr. Vol. 1. No. 2. pp. 43–48. With 4 text figs.

[49] DE FREITAS (Octavio). Estudos experimentaes sobre a raiva no Instituto Pasteur de Pernambuco.—*Archivos de Hyg.* Rio de Janeiro. 1930. May. Vol. 4. No. 2. pp. 127–138. English summary.

[50] BARCHI (Luigi). La chemioterapia della rabbia.—*Policlinico.* Sez. Med. 1930. Nov. 1. Vol. 37. No. 11. pp. 533–540. [33 refs.]

[51] MARIE (A. C.) & URBAIN (Ach.). Pouvoir antirabique du salicylate de soude.—*C.R. Soc. Biol.* 1930. Sept. 20. Vol. 104. No. 26. pp. 1206–1208. [1 ref.]

neither curative nor prophylactive properties when administered *in vivo*.

Bailly and Michel[52] report the effects of antirabic treatment (three doses of Remlinger's ether virus) on two dogs which suffered from paralyses. The first was suffering from distemper, and exhibited symptoms of an ascending paralysis principally affecting the hind legs. Antirabic treatment was given, and contrary to the authors' expectations the paraplegia regressed from the 7th day after inoculation until recovery was complete. The second suffered from a general paralysis of meningomyelitic origin following a course of treatment by ether vaccine. After some months a second course was given, and recovery rapidly followed. The authors discuss the possible modes of action of the vaccine in these cases, and report these observations for the benefit of veterinarians, particularly with respect to the paraplegia of distemper.

A. G. McKendrick.

Remlinger (P.) & Bailly (J.). La vaccination antirabique des animaux et du chien en particulier au Maroc en 1929.—*Rev. Gén. de Méd. Vét.* 1930. May 15. Vol. 39. No. 461. pp. 257–263. [1 ref.] [Pasteur Inst., Tangiers.] [See this *Bulletin*, Vol. 27, p. 755.]

Remlinger (P.) & Bailly (J.). La vaccination antirabique des animaux et du chien en particulier au Maroc en 1929.—*Rev. Vét. et Jl. de Méd. Vét.* 1930. July. Vol. 82. pp. 371–377. [1 ref.] [Pasteur Inst., Tangiers.] [See this *Bulletin*, Vol. 27, p. 755.]

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[52] Bailly (J.) & Michel (R.). Essais de traitement de la méningo-myélite du chien par le vaccin antirabique.—*Rev. Gén. de Méd. Vét.* 1930. July 15. Vol. 39. No. 463. pp. 392–397. [6 refs.]

REVIEWS AND NOTICES.

HARVARD INSTITUTE FOR TROPICAL BIOLOGY AND MEDICINE. **The African Republic of Liberia and the Belgian Congo. Based on the Observations made and Material collected during the Harvard African Expedition 1926-1927.** [STRONG (Richard P.), SHATTUCK (George C.), THEILER (Max), WHITMAN (Loring), BEQUAERT (Joseph C.), ALLEN (Glover M.), LINDER (David H.), COOLIDGE (Harold J.), Jr., Members of the Expedition.]—pp. xxvi+ix+1064. In 2 volumes. With 476 illustrations (including 7 coloured plates), 28 text figs. & 9 maps. Contributions from the Harvard Inst. for Trop. Biol. & Med. No. V. 1930. Cambridge : Harvard Univ. Press.

The most significant single sentence in this voluminous and admirably illustrated report is the following : " Although the Expedition, numbering eight in Liberia and seven in the Belgian Congo, spent about a year in tropical Africa, no member of it contracted dysentery or suffered from severe diarrhoea." Three methods of chlorinating water with calcium hypochlorite proved unsatisfactory ; halazone tablets proved useful and sufficiently stable for practical purposes for chlorinating water in canteens while on the march. Turbid waters were boiled. There was no serious illness among the members of the Expedition, only a few mild attacks of fever being recorded ; the malaria prophylaxis consisted of 15 grains of quinine on each of two successive days weekly. This record speaks well for the efficiency of the precautions taken to prevent disease.

The purpose of the Harvard Expedition was to make a biological and medical survey of Liberia, a country of which little is known in these respects, and the authors may well be congratulated if the general value of their survey comes up to the standard reached in their account of the medical conditions found in Liberia.

The picture painted of the medical administrators of this republic of negroes is not flattering, either to their accomplishments or to their intentions. It is well that a report of this kind should draw attention to the utter inadequacy of the medical assistance afforded to the mass of the Liberian people. The authors point out that Liberia, like Sierra Leone, constitutes a home for freed slaves and that the populations are about equal. Liberia has the lowest *per capita* expenditure, revenue and trade in Africa, yet has six times the public debt of Sierra Leone. Liberia maintains one poorly paid Liberian physician in Monrovia as against a staff of twenty-two medical officers in Sierra Leone. The government of Liberia spends almost nothing on the improvement of the condition of the people.

The Expedition records the absence from Liberia of plague and relapsing fever and also curiously the absence of Cordylobia infection. They discuss yellow fever and the prevalence of some of the vectors ; they deal with malaria and emphasize the superiority of the blood examination over spleen enlargement as a guide to its prevalence. Under schistosomiasis it is observed that in Liberia only one case of rectal infection with *S. haematobium* was seen, the usual form being vesical as in Sierra Leone. They encountered *S. mansoni* eggs apparently with some frequency in the faeces and once in the urine. They observe that MAASS had not found *S. mansoni* in Liberia. [If *S. mansoni* is common in Liberia this would constitute a difference from the findings in Sierra Leone. Dr. MAASS informed the reviewer that he had found several cases in his patients, not Liberians, but people from the French Territory.] On the other hand, terminal spined eggs were found in the faeces in several cases in the parts of the Belgian Congo round Stanleyville. The ova measured 162 to 169μ by 54 to 64μ. The measurements of ova given for *S. spindalis* are 163 to 258μ by 46 to 70μ and for *S. bovis* 160 to 180μ by 50 to 60μ. Antimony

thioglycollamide was tested in schistosomiasis with some success, and further trial is recommended.

Guineaworm infection is not common in Liberia, only one case being seen during the expedition. Onchocerciasis is prevalent and the Expedition confirmed the developmental cycle of this worm in *Simulium damnosum* in Liberia. It is not clear whether the breeding place of this insect has been discovered or not. On page 240, " We were successful in finding its breeding place about a mile from our camp in a swiftly flowing stream " (figured) ; on page 856, " at the time, these larvae and pupae were believed to be those of *E. damnosum*, although no adult flies were bred from them." The authors point out that their specimens differ conspicuously from the descriptions by KING and POMEROY. Hookworm infection amounted to 84 per cent. at one station, and Ascaris to 60 per cent. Rarely observed were gonorrhoea, hydrocele and aneurysm [this constitutes a marked difference from the conditions found in Sierra Leone]. Although several cases of sleeping sickness were diagnosed the conclusion reached is that it is not common, and it is noted that tuberculosis appears to be rare inland. That important group of diseased conditions in which various fungi have been described as the causative organisms receives a good deal of attention, but the authors are conservative in their conclusions.

This report will be of great interest to all who have some concern for African peoples and their advancement, and it will be of special value to those—mostly American presumably—who propose to enter Liberia.

D. B. Blacklock.

IMMS (A. D.) [M.A., D.Sc., F.R.S., Chief Entomologist, Rothamsted Experimental Station, Harpenden]. **Recent Advances in Entomology.**—pp. viii+374. With 84 text figs. 1931. London : J. & A. Churchill, 40, Gloucester Place, Portman Square. [12s. 6d.]

The advances and developments discussed in this volume show us Entomology, as always, a diversely interesting province of biology, and remind us that in its application to the life-history and the biological control of the insect-pests of agriculture entomology has now become a scientific profession of universal importance to mankind.

About half the contents of the volume are pure science—surface anatomy and morphology, interpretation of larval types and of metamorphosis, palaeontology and phylogeny, sense organs, sensory responses and reflex behaviour, and the nature and sources of insect colouring. All here is instructive and concise, and the chapters dealing in particular with sensory responses and reactions will well repay the attention of the medical officer abroad, who nowadays has to be something of a medical entomologist.

The other half of the book is devoted to insect ecology and parasitism as the scientific base of operations in the biological control of insect pests of agriculture. Insecticides and their use, and the insects that afflict man and other vertebrates, are definitely excluded ; but this should not repel the medical zoologist, who will here discover what a world of careful observation and forethought must precede and accompany the difficult work of waging biological warfare against noxious insects even in a *well-cultivated environment*. Under ecology certain conditions of insect life that are open to exact experiment are discussed, also climate and season, and symbiotic micro-organisms. A chapter on ecology in its application to treatment and antidote for insect pests of agriculture (" cultural control ") lies in the indeterminate and rather elevated land where all the daughters of Biology and Physiology hopefully osculate with Demeter ; it lies outside the borders of this *Bulletin*. A general survey of insect parasitism and its various types, phases and complexities leads up to and illustrates the theory and practice of " biological control," the theory and practice of deliberately engaging carefully sought and chosen predatory and parasitic insects to harry and

hold in check the insect pests of food-crops and growing timber and certain kinds of brushwood that in sundry parts of the world stifle pastures.

The story of the biological control of insect-pests of agriculture is material for a fifth Georgic, and although its setting and staging and its recurrent episodes lie outside the province of this *Bulletin* the present version of the story is well worth the attention of those of our readers who at times are concerned with the insect-pests of man and domestic animals.

A. Alcock.

KIRK (J. Balfour) [M.B., Ch.B.Ed., D.P.H.Oxon, D.T.M. & H.Eng., Colonial Med. Service, Director, Med. & Health Dept., Mauritius, etc.]. **Hints on Equipment and Health for Intending Residents in the Tropics.** Second Edition.—pp. xii + 128. 1931. London: Baillière, Tindall & Cox, 7 & 8, Henrietta Street, Covent Garden, W.C.2. [3s. 6d.]

Very little alteration has been made in this second edition of Dr. Balfour Kirk's useful book, but opportunity has been taken to make a few verbal alterations and to incorporate additional hints and suggestions communicated to the author by readers of the first issue. The most important addition is a short chapter on *Your Dog*; in it information is imparted as to the early signs of rabies and the measures to be taken if such are noticed. " If, after ten days, your dog shows no sign of hydrophobia [suspicious symptoms having previously been observed] set your mind at ease regarding the family, even if he should have bitten a member of the household. He will not have infected anyone in this case " (p. 108). This statement, though correct as a general rule, ignores the danger of intermittent, or remittent, rabies which may be very real (see this *Bulletin*, Vol. 24, p. 223). The book is pleasantly written, full of sound hints, and will doubtless maintain the popularity gained by the first issue.

H. H. S.